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THE ANNALS
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MAGAZINE OF NATURAL HISTORY,
INCLUDING
ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')
CONDUCTED BY

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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quelque soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands wild
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.



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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[THIRD SERIES.]

“ per litora spargite muscum,
Naiades, et circum vitreos considite fontes :
Pollice virgineo teneros hic carpite flores :
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas ;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchyliis succo.”

N. Parthenii Giannettasii Ecl. 1.

No. 7. JULY 1858.

I.—*Observations on the Reproduction of certain Nostochineæ.*

By M. G. THURET*.

[With a Plate.]

THE *Nostochineæ* are among those tribes of Algæ of whose reproduction we know least. About thirteen years ago I described the curious phænomena accompanying the reproduction of an aquatic *Nostoc*†. Since then, no one appears to have taken up this subject ; and M. Fischer‡, in his memoir on this family, remarks that my observations have remained isolated up to this time.

But the mode of reproduction which I made known is certainly not peculiar to one species. I cannot doubt that it will be found in all, when it is sought for with a little attention and perseverance. Already the correctness of this assertion has been

* Translated from Mém. de la Société des Sc. Nat. de Cherbourg, Aug. 1857.—A. H.

† Ann. des Sc. Nat. 3 sér. ii. p. 319 (1844). The plant forming the object of that paper was not the true *Nostoc verrucosum*, but a neighbouring species which M. Mougeot had published under this name (*Stirpes Crypt. Vog. Rhen. fasc. viii. no. 798*), and which now bears that of *Nostoc Mougeotii*, Bréb. (*Menegh. Monogr. Nostochin. Italic. p. 113; Kütz. Sp. Alg. p. 300.*)

‡ Beiträge z. Kenntniss der Nostochaceæ, Berne, 1853, p. 13.
Ann. & Mag. N. Hist. Ser. 3. Vol. ii.

confirmed by Dr. Montagne, in a note published by him last year on *Nostoc Boussingaultii**. For my own part I have repeated, some years since, on a terrestrial species common about Cherbourg, all the observations I formerly made upon *Nostoc Mougeotii*. In spite of the difference of station of the two plants, they were reproduced exactly in the same way, and presented exactly the same phenomena. The resemblance in this respect is so complete, that, finding no new fact demanding notice, I have thought it useless to publish these researches. If I determine to do so now, it is above all from a desire to profit by the talent of M. Riocreux to illustrate the subject by figures far more perfect than those which accompanied my preceding memoir. In the second part of this note I shall make known a mode of reproduction of another genus which offers a certain resemblance of structure to *Nostoc*, but which possesses a distinct fructification, of which the latter is destitute.

I.

Nostoc vesicarium, DC., is a small species with a globular frond, growing on the ground among mosses and blades of grass. It is met with abundantly around Cherbourg, on the coping of walls covered with earth, along turfed roads, &c. Young specimens are perfectly spherical, often combined in great numbers under the form of little grains of a blackish-green colour, the dimensions of which vary from microscopic minuteness to the size of a pea. In proportion as the plant enlarges, its frond becomes less regular; it produces convolutions and folds, and the largest specimens form sinuous expansions, resembling small specimens of *Nostoc commune*.

Under the microscope the frond presents the same structure as that of other species of *Nostoc*. It consists of a transparent gelatinous mass, smooth and firm externally, sometimes having a yellowish tinge at the borders, while within are entwined innumerable chaplets of greenish granules. These chaplets are simple, and are composed of an indefinite series of globular joints, formed of a slightly granular pale green substance. The row is interrupted at intervals by a larger globule, almost colourless or slightly yellowish, with contents more homogeneous and less refractive than those of the other joints: on each side of this globule is observed a little granulation situated at the point of contact with the adjacent joint (Pl. I. fig. 4). The chaplets are elongated by the repeated division of the green globules. Each of these, after having increased a little in the longitudinal direction of the row, is cut in half, and thus gives birth to two

* Note sur deux Algues nées pendant les expériences de M. Boussingault, Comptes Rendus, 1856, April 28.

new joints, which subsequently divide in the same way. As to the large globules, they do not divide, and they end by becoming detached from the chaplets without undergoing any change. They have long been regarded, though without any reason, as the reproductive bodies of *Nostoc*. M. Kützing even still continues to designate them by the name of *spermatia*. But this denomination, which M. Kützing, by a lamentable abuse, applies indifferently to most diverse organs, cannot be longer preserved here, any more than in many other cases where there is nothing to justify its employment. Among the different names that have been given to these large joints of the *Nostochineæ*, that of *heterocysts*, employed by Dr. Allman, seems to me the most suitable; and I shall adopt it the more willingly as it does not prejudice the function, of whose true nature we are at present ignorant.

It is during the months of September and October that we observe in *Nostoc vesicarium* the same series of phænomena that I have described in *Nostoc Mougeotii*. We at that time frequently find individuals whose contents escape in a diffuent greenish jelly, which spreads over surrounding bodies. This jelly presents exactly the aspect of a Palmellacean. But if a portion is placed under the microscope, we perceive that it is filled with fragments of chaplets intermixed with detached heterocysts. An attentive examination of these fragments of chaplets shows that at this epoch they are endowed with a creeping motion,—very slow, but easy to ascertain under a sufficient magnifying power. Placed in a drop of water, on a slip of glass, in front of a window, they gradually gather together at the margin of the drop nearest to the point whence the light comes. When one of these deliquescent Nostocs is placed in a saucer with a little water, the chaplets soon spread round the circumference, and form at the bottom of the saucer a greenish pellicle, as an *Oscillatoria* would do*.

If the observation of the fragments of the chaplets be continued for some days, they are soon seen to become motionless,

* The independent motion possessed by the chaplets of the deliquescent *Nostoc* did not escape Vaucher (*Conferves d'eau douce*, pp. 215, 216). It is especially evident in the aquatic species. At least, it appeared to me very marked in *Nostoc Mougeotii*, and Vaucher has made the same observation on *Nostoc verrucosum*. But it occurs also under the same circumstances in the terrestrial species, and I was in error in my former paper in raising some doubt upon this point. I have had particular opportunity of ascertaining it in fine specimens of *Nostoc commune*, gathered in warm damp weather in the month of June, when some portions were beginning to deliquesce. I mention this fact, because it was under the same conditions and at the same time of the year that Vaucher also observed the movement of the chaplets in this species.

and to acquire a transparent membrane (fig. 2). At the same time the green globules increase in magnitude; but this time their increase is in diameter, and no longer in the direction of the length of the chaplet. They thus become discoid: finally, they divide into two by a division which takes place in a direction opposite to that described above (fig. 3). Most of the globules divide once or twice in this way, and then the chaplet, considerably enlarged, has entirely changed its aspect. It is transformed into a transparent sac, of variable length, in which the doubled granules are arranged in parallel superposed ranks, often very distinctly and pretty regularly (fig. 4). But this regularity soon vanishes; the rows become joined together alternately; that is, the globule placed at the border of one rank becomes adherent to the globule placed above it, and the globule opposite, to that below it. In this way a new chaplet is formed, wound upon itself, in the interior of the sac. At the first instant it is difficult to distinguish this arrangement of the globules. Crowded in the narrow sac which the membrane forms, and attached together more or less obliquely, they often exhibit only a confused heap. But their enchainment becomes more and more evident in proportion as the young *Nostoc* grows; the sac dilates, the new chaplet becomes elongated, and its convolutions separate, and become more distinct (fig. 5). For some time longer the young frond still presents enlargements which correspond to the situation occupied by the rows of globules: by degrees these traces are effaced, and the frond becomes developed into a transparent rounded mass, in the interior of which the chaplet turns and twists in all directions. At this epoch we may already distinguish some heterocysts among the globules. The figures comprised under the numbers 2, 3, 4 and 5 will, I think, give a sufficient idea of the different aspects presented in the transformation of a chaplet of *Nostoc* into a new individual. This phenomenon presents numerous variations of the details, upon which I consider it useless to dwell here. I shall confine myself to the following observations.

In general the terminal globules of the chaplet do not undergo the same modifications as the rest. They lose their colour like the heterocysts, and remain attached to the extremities of the chaplet, without taking part in the development I have just described. Sometimes we find them a long time after, still adherent to the surface of the young frond.

Frequently, also, one of the intermediate globules becomes transformed into a heterocyst. Sometimes even two or three are produced at different intervals in the length of the chaplet (fig. 4). The latter thus becomes divided into two or more

portions, which proceed with their development independently. Hence it is that we not unfrequently observe under the microscope, young examples of *Nostoc* attached together by an interposed heterocyst.

II.

The other *Nostochineæ* of which I have to speak belong to the genus *Cylindrospermum*, Ralfs (Kütz. *pro parte*). This genus comprehends a portion of the species which were formerly united under the name of *Anabaina*, Bory, and which consist of moniliform filaments, analogous to the chaplets of *Nostoc*, but forming an indeterminate gelatinous stratum. Certain joints of the filaments are transformed into heterocysts; others acquire an elliptical form, more considerable dimensions, and become the sporanges. The different positions which may be occupied in the filament by the sporanges and heterocysts have served to break up *Anabaina* into several genera. Those proposed by M. Kützinger are too vaguely defined to be adopted without restriction. Mr. Ralfs has proposed divisions founded upon more precise conditions, which seem to me admissible*. I shall merely remark, that it is at least superfluous to separate generically plants united by such close affinities, and that it would be better to restrict the divisions established by Mr. Ralfs to the rank of subgenera, preserving the name of *Anabaina* for the whole group of species. As to the latter name, it should be maintained in any case; and Mr. Ralfs is wrong in proposing to replace it by *Trichormus*, Allm., supposing that the priority belongs to the genus *Anabæna*, established by M. Ad. de Jussieu in the family of Euphorbiaceæ. The latter was only published in 1824†, while Bory St. Vincent's genus dates from 1822‡.

In the genus *Cylindrospermum*, as defined by Mr. Ralfs, the heterocyst forms the last joint of the filament, and the sporange occupies the next joint. The filaments are endowed with a very slow but appreciable creeping motion. The joints are cylindrical; they contain a substance of a bluish-green colour, a little granular, and they multiply like those of *Nostoc*; that is to say, after having elongated in the direction of the length of the filament, they become cut in two by a transverse division. The last joint, before changing into a heterocyst, is like the rest, but the granules it contains disappear by degrees; the joint acquires a yellowish tinge, becomes larger, and assumes a more or less elongated ovoid form (fig. 8). At this epoch it is almost always

* Ann. Nat. Hist. 2nd ser. v. p. 321. pl. 8 & 9 (1850).

† De Euphorbiacearum generibus medicisque earum viribus tentamen, p. 46.

‡ Dictionnaire classique d'Histoire Naturelle, i. p. 307.

found surrounded by a few irregular mucous filaments. These filaments (*cils*), the presence of which is very common on the heterocysts of *Anabaina*, are probably nothing more than parasitic productions.

After the formation of the heterocyst, the sporangium is very soon developed at the expense of the next joint. This becomes elongated, enlarged, and its contents become very granulose. By degrees its walls become thickened, and assume a brown colour. It is not, as Mr. Ralfs states, the substance contained in the sporangium which takes this colour; it is merely the wall of the cell. The interior of the sporangium is filled up by an elliptical spore, which may be distinguishable through the transparency of the sporangium, and which preserves the green colour, as may be easily ascertained by causing it to emerge from the sporangium by slight pressure. Filaments are often met with terminated at both ends by a heterocyst. It is more rare to see one filament bearing a sporangium at each extremity, and in such cases it has always appeared to me that the development of one of the sporangia has preceded that of the other (fig. 9).

M. Fischer, in the memoir above cited, mentions an observation of M. Nägeli on the germination of *Cylindrospermum**. The description which he gives, besides being very short and incomplete, does not appear to agree with what I have seen myself in these plants.

The first species in which I observed the reproduction is remarkable from the rugose surfaces of its sporangia. The filaments are about $\frac{1}{3000}$ to $\frac{1}{6000}$ th of an inch in diameter. It is the same plant that has been published in the 'Fasciculi' of M. Rabenhorst† under the name of *Cylindrospermum majus*, Kütz. It is possible that it may be really the species thus named in the 'Species Algarum;' but I cannot affirm anything on that point; for M. Kützinger does not mention the rugose aspect of the sporangia, and the 'Tabulæ Phycologicæ' of the same author are unfortunately far from supplying the deficiencies of his diagnoses.

I found this species, in the month of June of last year, floating in a ditch in mucilaginous masses. The sporangia were abundant, of a brown colour, and appeared perfectly ripe. This circumstance induced me to place some fragments of the plant in a drop of water upon slips of glass, keeping them under a

* "In *Cylindrospermum*, Prof. Nägeli has actually observed the germination. After a longish stage of rest, a repeated division suddenly occurs in the cells; the outer thick wall is dissolved, and the young filament commences its growth by simultaneous division of all its cells."—Fischer, *l. c.* p. 7.

† Die Algen Sachsens, no. 411.

bell-glass to prevent evaporation. The filaments soon became decomposed; the heterocysts lost their colour, and were in part detached from the sporanges. A great number of the latter were also spoilt, and the spores which they contained vanished without leaving a trace. But others were preserved without any change of aspect. I continued to observe them with care, and in the course of the month of September, I had the pleasure of seeing the spore at last pierce the summit of the sporange, and become developed into a new filament, in the following manner. The spore, becoming elongated, lifted up a little piece of the internal wall of the sporange, which it pushed before it. As soon as it had made its way out, it began to exhibit septa, and to change into a torulose filament, composed of three or four joints, filled with very granular contents. The divisions of the joints are at first rather indistinct, but become more and more clear in proportion as new ones are formed. For rather a long time the fragment of the wall of the sporange which has been lifted up by the spore remains at the summit of the filament in the form of a little cap covering the last joint (fig. 12). The filament elongates simultaneously at both ends, but more rapidly at first at that which is outside the sporange. The new joints are of less diameter than those formed in the place occupied by the spore, so that the young filament is slightly attenuated at the extremities (fig. 13). By degrees, however, these differences are effaced; the joints, in multiplying, acquire dimensions more and more equal; their granules become less apparent, and the resemblance of the new filaments to the old ones is at last complete.

I have subsequently discovered that this experiment succeeds just as well, or still better, with specimens dried and preserved for several months in the herbarium, provided the spores are quite ripe. On placing them in the same way on slips of glass with a drop of water, I have seen them begin to germinate in about a fortnight. The spores of *Anabaina* therefore belong to that category of reproductive bodies which M. Al. Braun* calls *hypno-spores*, and which are susceptible of development after a long period of repose, and in spite of prolonged desiccation. In many freshwater Algæ we find reproductive bodies provided with this persistence of vitality, which seems to be a condition necessary for the preservation of the plants during the alternations of drought and humidity to which they are exposed; but none, I think, are better endowed in this respect than the species of *Anabaina*, as the following example will show.

In the month of April 1848, I gathered fine specimens, well in fruit, of *Anabaina licheniformis*, Bory (*Cylindrospermum*

* Algarum unicell. genera nova, p. 16.

licheniforme, Kütz.). In this species the sporanges are smooth, and of a deep brownish red when they are perfectly ripe. In the spring of the present year (1857), I detached a few fragments of these specimens, which I had preserved in the herbarium for nine years, and subjected them to the same experiments as the preceding. A fortnight had scarcely elapsed when a great number of sporanges began to open, and to emit the summit of the young filament. I have repeated this experiment several times with the same success; and in those which I made this summer, I have often seen the spores germinate at the end of six or seven days. The germination of this species exactly resembles that of the preceding. Only the little portion of the wall of the sporange, lifted up by the spore like an operculum, is not carried away at the summit of the filament, but remains attached laterally upon the sporange (fig. 7).

I should have desired to have made the same trials with specimens of still greater age. It would be interesting to ascertain how long a time the spores of *Anabaina* can preserve their faculty of germination. But the success of these experiments requires, as I have said before, that the spores shall be perfectly ripe. Now, it is more rare than one would suppose, to find them in this state in herbaria. I have assured myself of this by examining all the specimens in my collection and that of Bory St. Vincent; and this difficulty has prevented me from carrying my researches any further.

EXPLANATION OF PLATE I.

[All the figures are magnified 330 diameters.]

Fig. 1. Two of the filaments or chaplets filling the interior of *Nostoc vesicarium*, DC.

Fig. 2. Chaplet clothed by a transparent membrane.

Fig. 3. Chaplet, of which the globules are enlarged and beginning to divide.

Fig. 4. Chaplet with the multiplication of the globules more advanced.

Fig. 5. Course of development of the chaplets into new fronds.

Fig. 6. Two sporanges of *Anabaina* (*Cylindrospermum*) *licheniformis*, Bory. That on the left contains a spore; the other is empty. The membrane of the latter exhibits slight punctations.

Fig. 7. Germination of the same. The spore pierces the summit of the sporange, and elongates into a moniliform filament, which soon becomes similar to that of the mother-plant.

Fig. 8. The filaments of *A.* (*Cylindrospermum*) *major*, Kütz., in different states. That on the left is the youngest. The terminal joint, rounded at the free extremity, is beginning to change into a heterocyst. In the next the heterocyst is already formed, and surrounded by a few mucous threads. In the third the sporange is beginning to develope.

Fig. 9. Filament with a sporange formed at each extremity.

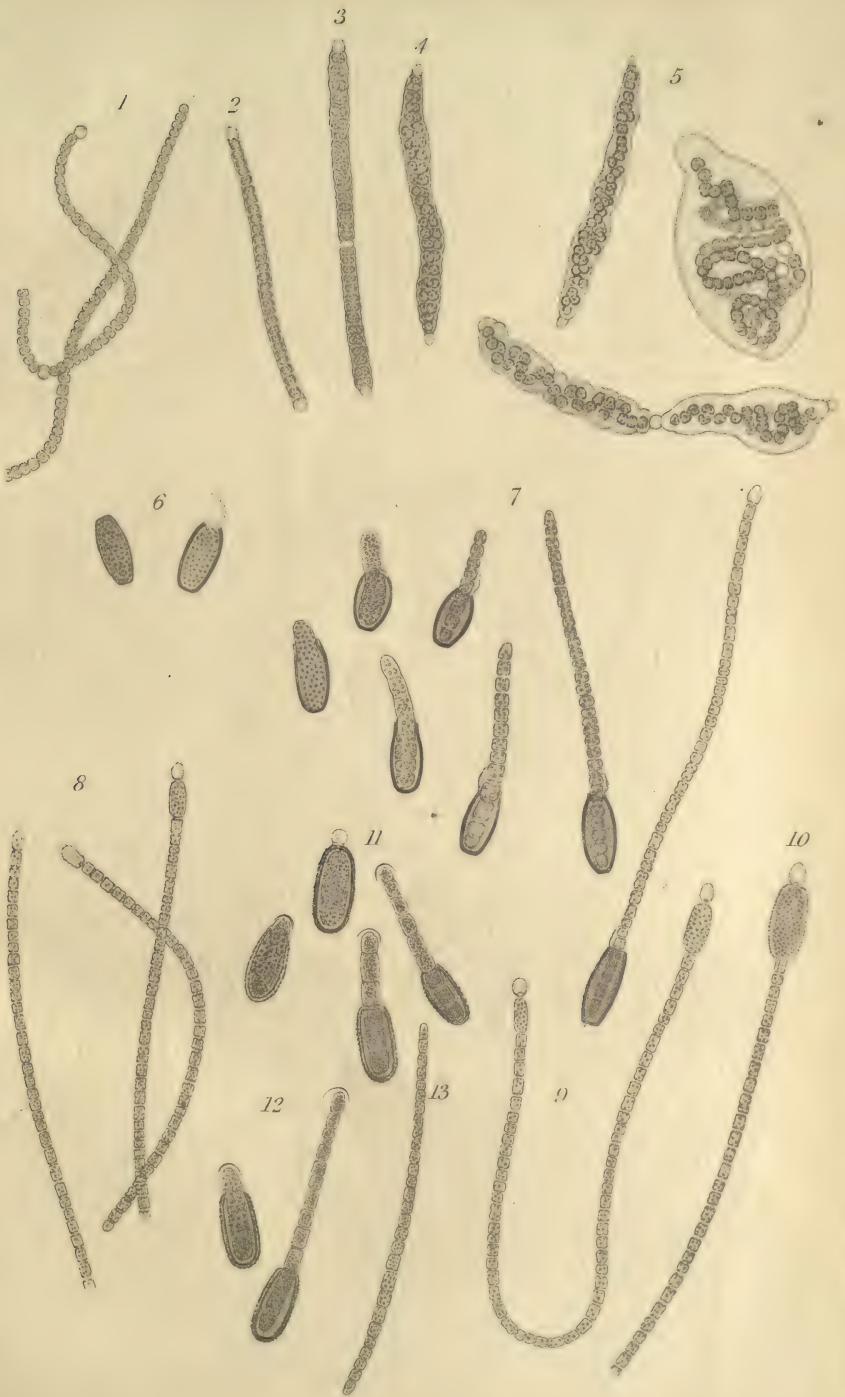




Fig. 10. Filament bearing an older sporange.

Fig. 11. Spore detached and quite ripe. It is still surmounted by a heterocyst. The transparency allows the enclosed spore to be distinguished.

Fig. 12. Germination.

Fig. 13. A young filament produced by germination of the spores.

II.—*On some new Trilobites from Canadian Rocks**. By E. J. CHAPMAN, Professor of Mineralogy and Geology, University College, Toronto.

I. *On a new species of Asaphus from the Silurian Rocks of Upper Canada.*

§ 1. *Introductory Notice.*—In the autumn of 1856, I communicated to the ‘Canadian Journal,’ under the title of *Asaphus Canadensis*, a brief notice of a supposed new Trilobite from the Utica schist (Lower Silurian) of Whitby, in Canada West; and in a subsequent number of that publication, I gave a more detailed description of the form. At the same time I pointed out that Professor Hall of Albany believed it to be identical with a species founded by him (under the name of *Asaphus* (?) *latimarginatus*) on two imperfect caudal shields, figured in the first volume of his ‘Palæontology of New York.’ At the period in question, I was not in a position, from the want of works of reference and other sources of information, to claim this Trilobite as actually new; but an extended investigation having shown it to be really a distinct form,—a view also adopted by others,—I now publish a complete description of the species, together with as accurate a figure as I am able to get executed in Canada (see p. 13). In this communication, also, I have attempted to show, by a brief analysis of all the fairly-established species of the genus *Asaphus*, that our Canadian species is undoubtedly distinct. I should state, with regard to the figures of Professor Hall, alluded to above, that it is impossible to determine whether our species be identical or not with these. In the words of Barrande, in his great work on the Silurian Basin of Bohemia, they are too incomplete to be determined with any certainty†. For this reason, in the Museum of the Geological Survey of Canada, the specific name of *Canadensis*, as originally bestowed on this Trilobite by the author, has been retained. Barrande, in the work just cited, alludes to another American Trilobite in

* Communicated by the Author.

† “Divers fragments d’Amérique nommés *Asaphus* par J. Hall, et figurés dans la Paléontologie de New York, sont trop incomplets pour être sûrement déterminés.”—Barrande, *Système Silurien du Centre de la Bohême*, vol. i. p. 657.

the possession of M. de Verneuil, but unnamed and unfigured, with which our species may very possibly agree; only the caudal shield of this specimen would appear to possess no lateral segmentation, and to have scarcely a defined axis, as M. Barrande refers it to the *platycephalus* or *gigas* type*. His statement respecting it is as follows:—"Nous avons vu récemment, dans la belle collection de notre ami M. de Verneuil, un *Asaphus* des États-Unis, qui, portant à l'angle génal une pointe longue et grêle, constitue une espèce très distincte d'*As. (Is.) gigas*. Malheureusement, nous ne savons quel est le nom spécifique qui lui a été donné par les savans Américains. Ce Trilobite se rangerait dans le groupe de *A. gigas*, d'après les souvenirs qui nous restent de sa conformation."

§ 2. *Description of Asaphus Canadensis*.—This description is based on what is probably the long or male form.

General outline a broad oval. Vertical to transverse diameter nearly as 3 : 2. Relative lengths of head-shield, thorax, and pygidium, as 1 : 0.88 : 1.1.

Head-shield obtusely pointed anteriorly, much as in *Asaphus platycephalus*. Genal angles terminating in sharply-pointed horns of the *paradoxides* type, extending downwards to about the middle of the body†. Facial suture as shown in the figure; the branches uniting in an obtuse but clearly defined angle above the glabella, nearly at the extreme anterior margin of the head-shield, and terminating at the lower margin, about midway between the glabella and the genal angles. Glabella feebly raised, broad, and generally conformable at its upper part to the outline of the facial suture. At its base there occurs a slight but evident neck-furrow. There are no furrows on the glabella itself. Length of glabella to length of head-shield as 0.8 : 1.0. Eyes moderately raised and delicately reticulated, although in most specimens they are more or less destroyed. Breadth between the eyes, to extreme breadth of head-shield across them, as 5 : 11. Whole surface of the head-shield covered with fine punctures, except at the striated limb.

Thorax with eight segments. Axis well defined; narrow, somewhat broader in the middle than at the ends. Mean breadth of axis to breadth of each side-lobe, as 5 : 6. Pleuræ terminating in slight points, and curving slightly downwards‡; fur-

* It is perhaps the *Asaphus Iowensis* of Dale Owen.

† In most specimens, as in the figure, the horns extend to the bottom of the fourth thoracic segment; but in a small specimen obtained quite recently from Whitby, and kindly submitted to us by Mr. J. F. Smith of Toronto, they reach to about the middle of the sixth pair of pleuræ.

‡ In the horned *Asaphidæ*, and in nearly all the horned Trilobites, the pleuræ point downwards; whilst in the forms with rounded genal angles,

rowed to about half their length from the axis, and then crossed obliquely by a curvilinear ridge. A second, but slighter, furrow runs along the lower edge; and two short deep furrows, shaped together like the letter V placed upon its side with the point inwards, separate each pleura from its axis-segment. Beyond the ridge the points are delicately striated. Fine punctures occur upon the axis and also on the pleuræ. On the latter the punctures are larger and farther apart; and, when examined through a magnifying glass, they appear to be of a semilunar form, with the convex side turned inwards; they are likewise more deeply indented at the convex side.

Pygidium oval, with striated limb and well-developed tapering axis. This terminates somewhat abruptly before reaching the end of the pygidium. It contains from 12 to 14 segment-markings, and a similar number are present on the side-lobes. All are destitute of secondary furrows. Those on the side-lobes bend downwards near their extremities, and merge into the striated limb. The lower ones are nearly vertical. The whole surface of the pygidium is covered with fine punctures, shaped and arranged exactly like the punctures on the surface of the thorax. *Asaphus platycephalus*, as mentioned by Professor Hall, exhibits in some specimens a delicately punctured surface; but in the present species the punctures appear to be much more striking. Our other new species, *A. Halli*, is also very visibly punctured, although the punctures, as shown in our figures, are too coarse and too far apart.

The only specimens of *Asaphus Canadensis* hitherto obtained, have been procured from the Utica schist (Lower Silurian) of the townships of Whitby and Nottawasaga (localities about 80 miles apart), in Canada West. They occur in association with *Triarthrus Beckii*. In length they appear to vary from about an inch and a half (= 38.1 millimetres) to about 5 inches (= 127 millimetres). I have not yet been able to observe the under side, so as to make out the direction of the under sutures and the form of the hypostoma. An isolated hypostoma, however, found near Whitby, probably belongs to this species. It is badly preserved, but it appears to resemble very closely the hypostoma of *A. platycephalus*.

§ 3. *Specific differences*.—(1.) *Asaphus Canadensis* differs from *A. platycephalus*, Stokes (*Isotelus gigas*, Dekay); *A. expansus*, Linn.; *A. Barrandeii*, De Verneuil; *A. læviceps*, Dalman; *A.*

the pleuræ have almost invariably an upward curve, as in the figure of *A. Halli*, on page 13. When the side-pieces or cheeks of the head-shield are broken off, we may generally determine the nature of the genal angles by this character.

(*Is.*) *affinis*, M'Coy (including *Is. gigas*, *Is. planus*, and *Is. Powisii* of Portlock)—in having, with other opposing characters, the genal angles of the head-shield extended into horns.

(2.) It differs from *A. tyrannus*, Murchison, *A. Powisii*, Murchison, and *A. ingens*, Barrande—in having, with other opposing characters, the branches of the facial suture united above the glabella on the upper surface of the head-shield.

(3.) It differs from *A. nobilis*, Barrande, in wanting the curved furrows on the axis of the pygidium, as exhibited by that species; and also by the greater number of the segment-markings on the side-lobes of its pygidium, as well as by the general outline of the facial suture, and other characters.

(4.) It differs from *A. extenuatus*, Waldheim, by the obtuse outline of its cephalic shield, and by other marked characters.

(5.) It differs from *A. (Is.) laticostatus*, Green,—the genal angles of which are unknown,—by its thorax being nearly of the same length as its head-shield, and by the greater number of segment-markings on the side-lobes of its pygidium, as well as by other characters.

(6.) It differs from *A. ovatus*, Portlock, by the presence of segment-markings on the side-lobes of its pygidium. I am not acquainted with the head-shield of *A. ovatus*, and I cannot here obtain a copy of Colonel Portlock's Report in which the species is figured.

(7.) It differs from *A. angustifrons*, Dalman, and *A. frontalis*, Dalm., by the greater development of its genal points; Dalman's species being placed by him under his subdivision "*Mutici*," comprising the forms with rounded or but slightly pointed genal angles. I am not sufficiently acquainted, however, with these Swedish species to name any other distinguishing characters; and I have no means of procuring here a copy of Dalman's '*Palæaden*,' in which the species are described.

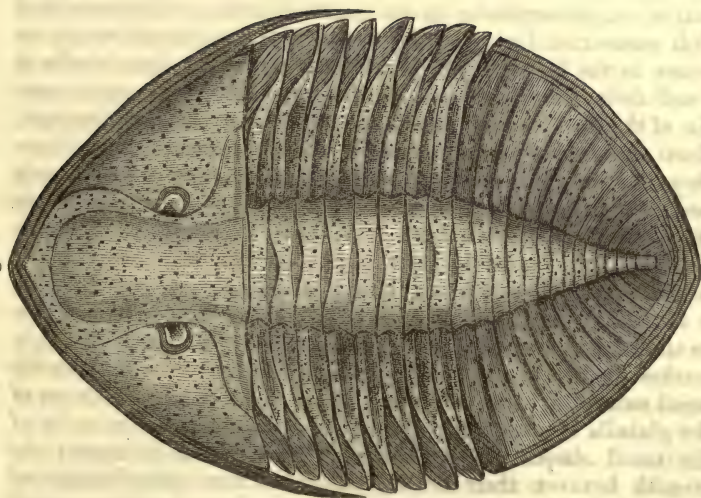
(8.) It differs from *A. Iowensis*, Dale Owen, by its genal points reaching only to the middle instead of to the end of the thorax; by its facial suture being pointed, instead of curved, above the glabella; and by the presence of segment-markings on its pygidium.

The head-shields of *A. grandis*, Sars, *A. Fournetti*, De Verneuil, and *A. latimarginatus*, Hall, are still unknown.

(9.) It differs from *A. Cianus*, Barr. (the genal angles of which are unknown), by its slightly raised glabella and by its narrow body-axis.

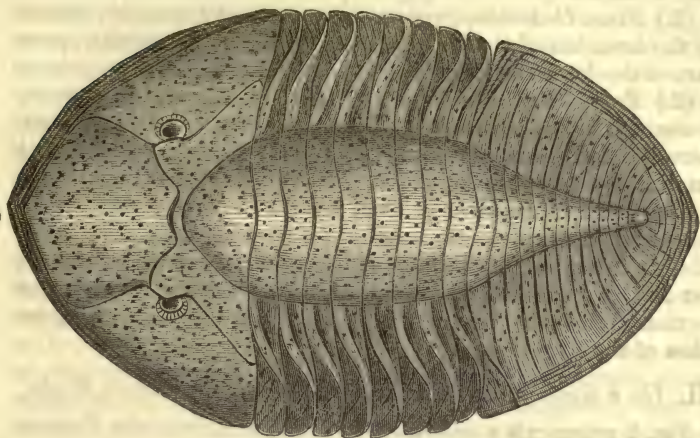
(10.) It differs from the imperfectly-known *A. glabratus* and *A. contractus* of Barrande, by its feebly raised glabella, by the greater number of segment-markings on the side-lobes of its pygidium, and probably also by the direction of its facial suture.

Fig. 1.



Asaphus Canadensis (E. J. Chapman, sp. 1856).

Fig. 2.



Asaphus Halli (E. J. Chapman, sp. 1858).

Finally, apart from the absence of secondary furrows on the pygidium-segments, *Asaphus Canadensis* differs from the generally admitted species of *Ogygia* by the following characters:—

(1.) From *O. Buchii*, Brongniart, and *O. (?) Portlockii*, Salter, by the branches of the facial suture being united on the upper part of the head-shield.

(2.) From *O. (?) Guettardi*, Brongniart; *O. (?) Desmaresti*, Brong.; *O. (?) Brongniarti*, Rouault; and *O. (?) Edwardsi*, Rouault—by the angular junction of the branches of its facial suture above the glabella.

(3.) From *O. radians*, M'Coy, by the large number of the segment-markings on the axis of its pygidium, *O. radians* exhibiting only three. The head-shield of *O. radians* is unknown; but M'Coy refers the species to *Ogygia*, on account of the short segmental furrows between the larger markings on the side-lobes of the pygidium.

II. On a second new species of *Asaphus* from Canadian Rocks.

Fig. 2 represents a new species of *Asaphus*, from the Trenton limestone (Lower Silurian) of Peterborough and other localities in Upper Canada. The same form is believed to occur also in the Utica schist.

General outline a broad oval; length to breadth as 3 : 2, or thereabouts; relative lengths of head-shield, thorax, and pygidium, as 1 : 0·87 : 0·87.

Head-shield obtusely pointed anteriorly, and much resembling that of *A. platycephalus* in its general outline. Limb striated with concentric lines; genal angles rounded; facial suture as shown in the figure. The branches unite above the glabella in a well-defined angle, almost touching the extreme anterior margin of the head-shield; and they terminate at the lower margin, about midway between the glabella and the genal angles. Where they join this lower margin, they make a short curve inwards (see the figure), somewhat as in *A. expansus*,—a peculiarity not exhibited by the facial sutures of *A. platycephalus* (?) or *A. Canadensis*. Glabella feebly raised, and divided into two distinct portions; the lower portion, of a semi-oval shape, is defined, as it were, by a prolongation of the body-axis. Directly above this an undulating furrow occurs (as shown in the figure), strongly marked in the centre, but becoming fainter where it joins the facial suture, a little above the eyes. The anterior portion of the glabella is altogether undefined. The eyes appear to be of the usual *Asaphus* type; they are somewhat wide apart; the breadth between their central points, to the entire breadth of the head-shield across them, is as 5 : 9. Except at the striated limb, the whole surface of the head-shield is finely punctured.

Thorax with eight segments; division-line between the axis of each segment and its pleuræ not very sharply defined. There are no intermediate V-shaped furrows, as in *A. Canadensis*. The pleuræ curve upwards at their slightly rounded extremities; they are furrowed to about half their length from the axis, and then crossed by a curvilinear ridge, beyond which the upper portions are delicately striated. The axis and the side-lobes (in the transverse measurement of the Trilobite) are of equal breadth. The middle segments of the axis are slightly broader than the upper and lower segments. The surface is very delicately punctured. The pygidium closely resembles that of *A. Canadensis*. In the axis there are from twelve to fourteen segment-markings, with a similar number on each side-lobe. There are no secondary furrows. The striæ on the limb are largely developed. Hypostoma, &c., unknown.

The two nearly perfect specimens and the various fragments of this species that I have examined, belong to individuals of comparatively large size. Of the perfect specimens, one is nearly 5 inches in length (= 127 millimetres), and the other exactly 6 inches (= 152.4 mill.).

Specific differences.—*Asaphus Halli*, on account of its rounded genal angles, need only be compared with the following species: *A. platycephalus*, Stokes (*Is. gigas*, Dekay, &c.); *A. expansus*, Linn.; *A. leviceps*, Dalman; *A. Barrandei*, De Verneuil; and *A. (Is.) affinis*, M'Coy, the latter species being made to include Portlock's *Is. gigas*, *Is. planus*, and *Is. Powisii*. All the other well-recognized species of *Asaphus* are horned forms.

The new species differs from *A. platycephalus* more especially by its divided glabella, and by the presence of furrows on its pygidium.

It differs from *A. expansus* and *A. leviceps* by the form of the glabella, the angular junction of the branches of the facial suture, and the segment-markings on the side-lobes of the pygidium. The latter character distinguishes it also from *A. affinis*.

It differs from *A. laticostatus*, Green,—of which species the genal angles are unknown,—by its thorax and pygidium being of equal or nearly equal length, and by its divided glabella.

M. de Verneuil's species, *A. Barrandei*, from the south of France, is only known to me by name. Reasoning from analogy, however, it may be fairly admitted that the two species are distinct.

Our new Canadian species somewhat approaches Barrande's *Asaphus nobilis*, by the curious transverse furrow on its glabella. In *A. nobilis*, however, the genal points of the head-shield terminate in horns, and the segments of the thoracic and caudal

axis are marked by peculiar furrows,—characters not exhibited by the present species. The transverse furrow on the head-shield probably corresponds more or less in outline with the underlying hypostoma; but no traces of the latter organ, as already remarked, have yet been found.

In the preceding article on *Asaphus Canadensis*, it was stated that Professor Hall had published, in the first volume of the 'Palæontology of New York,' two imperfect caudal shields, under the name of *Asaphus* (?) *latimarginatus*. I would willingly adopt this specific name for our second Canadian form, because, so far as it is possible to determine, the two may prove eventually to be alike; but, on due consideration, I have thought it advisable to bestow upon the form in question a name altogether distinct. My object in this is solely to avoid the chance of confusion, in case the thorax and head-shield of Professor Hall's form should hereafter be discovered, and be found on examination, as would very likely happen, to constitute a different species. I therefore claim the privilege of naming the Trilobite described in this article,—a privilege to which I am justly entitled by the really indefinite character of the figures referred to above. The name I adopt as the most appropriate, under the circumstances of the case, is that of *Asaphus Halli*. Palæontologists, I am sure, will receive it willingly.

III.—On the Structure of *Humphreyia*, an anomalous Bivalve Shell, hitherto confounded with *Aspergillum*. By Dr. J. E. GRAY, F.R.S., V.P.Z.S. &c.

In the preceding Number of this Journal, I gave an account of the development of the genus *Aspergillum*. Shortly after it was in print, Mr. Cuming kindly allowed me to examine the specimens of that genus in his extensive collections. I was delighted to find, mixed with the other species, a shell, which I was convinced, on a very cursory glance, could not be formed in the same manner as the *Aspergilla*, and, indeed, could have but very little relation to the other species of the genus to which it has been referred by Mr. Arthur Adams, who described and figured it in the 'Proceedings of the Zoological Society' for 1852 (p. 91. t. 15. f. 3), under the name of *Aspergillum Strangei*. It was received from Sydney Bay, Australia, by the late Mr. Strange.

This animal, instead of living in a tube sunk in the sand or mud of the sea-coast, like the *Aspergilla*, or in a tube more or less immersed in the substance of shells, rocks, or other marine bodies, like the *Gastrochænæ* and *Clavagellæ*, fixes itself by its ventral surface to shells or rocks, so that the whole of the

shell, including its tubular prolongation, is exposed, giving it the appearance of a specimen of *Vermetus* or *Serpula*; and, like the *Vermeti*, the tube is covered with a distinct thin periostraca.

When the shell is more carefully examined, it is clear that it has been formed by a conchifer; for, like *Aspergillum*, the two valves of the young animal are to be seen forming a kind of umbo at the dorsal part of the base of the tubular projection.

But instead of the animal, as in *Aspergillum*, living free in the tube until it has attained its full size, and then fixing the shell in the substance of the tube itself, and closing its base, the animal of *Aspergillum Strangei* evidently attaches itself, shortly after it is hatched, by its ventral surface, to some fixed body; and then, as it requires room for its increased size, produces the hinder part of its shell into a projecting tube. For it is evident that the valves themselves are expanded below and on the sides, and are produced behind into the subquadrangular tube with a circular aperture; while, in the true *Aspergilla*, the valves are imbedded in the substance of the tube, and are to be seen, in all the species of the genus, of their full size, and with a well-defined edge on the inside of the tube; in some kinds only the umbones, and in others a larger part of the valves, being left exposed on the outer surface of the tube.

The valves of the newly-hatched free animal of *Aspergillum Strangei* are very soon united together, by shelly matter deposited on their inner surface, into a single shield-like shelly plate, which is extended on the sides; and the gap between the valves in front and below is filled up with a shelly deposit, which, with the united valves, forms a slipper-like bag attached by its ventral or lower side to the surface of some shell or rock; so that the shell has changed from a free, regular-shaped bivalve shell to a sessile, attached, slipper-like case. The shell is then gradually extended behind into a tube, as the animal requires a larger cavity for its protection, the periods of its enlargement being marked by transverse concentric impressed grooves.

The part of the tube in front of the valves is irregularly prominent, and scattered with shelly tubes, showing that the animal, like *Aspergillum*, is furnished with thread-like tentacles on the front of its mantle, which are emitted through these tubes; and there is also a series of holes, often placed in pairs, and sometimes produced into flat processes, on the edge of the ventral part of the tube, just above the part which is attached to marine bodies, doubtless for the protrusion of similar tentacles. The cavity of the shell is quite simple, without any indication of the shape of the two valves which are seen externally, or of

the valves which are seen in the interior of the tube in *Aspergilla*.

This shell must form a distinct genus, which I have named *Humphreyia*, after George Humphrey, the shell-dealer and conchologist, who published the Catalogue of M. De Calonne's collection, in 1797; and I have no doubt it is the type of a new family, *Humphreyiadae*.

The two specimens in Mr. Cuming's collection which are here figured (figs. 1 & 2), are very unlike; and this difference has assisted me in giving the above account of their structure and formation.

In the larger one (fig. 1) the valves of the shell were considerably enlarged and well developed, approaching the form of ordinary bivalve shells, before the animal developed the slipper-like case by which they are attached, and began to develop the hinder tube. In the other specimen (fig. 2), on the contrary, the shelly valves are scarcely more developed than they were on the newly-hatched animal, which appears to have proceeded at once, as soon as it came into the world, to form the bag-like cavity over the gape in front and between the ventral edge of the valve, to attach itself to the rock, and to proceed to develop its tube.

It may be observed, though we are not able to assert it positively (as there are only two examples known), that the difference between the two specimens depends on the kind of place to which the animals were attached: the larger one was attached to a mussel-shell, and the other to a piece of rough sandstone rock.

I was glad to see, on consulting Mr. A. Adams's description of this shell, for the purpose of quoting his name and figure, that he had observed this peculiarity, and agrees with me as to the manner in which the tube is formed. He observes: "The fact of the tube being nothing more than the valves greatly expanded and modified, is well shown in one of the specimens." (P. Z. S. 1852, 91.) It does not appear whether Mr. A. Adams considered this formation of the tube as a peculiarity of the species, or as explaining the development of the tube of *Asper-*

Fig. 1.



Fig. 2.

*Humphreyia* Strangei.

gillum in general; most probably the latter, as in his work published since the paper, he still places the species in the subgenus *Foegia* of the same genus.

Some persons, to whom I have stated my idea of the structure of *Humphreyia*, have suggested that the tube of *Aspergillum* might be developed in a similar manner, after the animal had attained its full size in the sand, without any tube; and they explain in this way why the tube of several species of *Warnea* is nearly cylindrical; but the tubes of many species are clavate, small at the siphonal and large at the front end. I cannot agree to this theory, as I do not know of any mollusk that lives sunk in the sand, and then develops a tube; while, on the other hand, *Teredo*, *Gastrochæna*, and other conchifers which live in tubes, form them as soon as they are hatched, and the tube may be observed increasing in length and diameter as the animal grows,—sometimes even, as in *Furcella*, forming a septum across its base, which is removed when the animal again desires to enlarge its habitation. It is further to be observed, that though the tube of some *Gastrochæna* and *Teredines* is clavate, yet in other *Teredines* it is nearly cylindrical; and in all these the siphonal end is modified, sometimes elongated, or even reproduced during the life of the mollusk, as in *Aspergillum*. A good account of the manner in which *Gastrochæna* enlarges its more or less exposed, irregular clavate, or retort-like tube, would be an interesting communication, as it is difficult to understand how the small closed chamber of the young shell is altered to the larger chamber of the full-grown individual, unless the animal absorbs and re-deposits the base of the tube after it has increased its size, as the animal of *Furcella* is shown to do, in my paper on the development of that genus in the ‘Annals’ for April 1858, p. 295; but I have not observed any specimen which justified my coming to that conclusion.

We have been long aware that the valves of *Aspergillum* and *Clavagella* are, when the animals reach the adult size, soldered into the tube in which they live, which caused them to be formerly regarded as univalve, and arranged with the *Serpulæ*; and the exterior appearance of *Humphreyia* would justify such a position in any cabinet.

It appears to me that the anomalous structure of *Mulleria* more nearly resembles that of this shell than any other I know; for, in both, the animal is hatched with two symmetrical valves, which become united together, and are prolonged behind into a tube. But there the similarity ends; for in *Mulleria* the tube is expanded into two laminæ or valves, one of which is attached to a rock, the upper lamina breaks off in an irregular manner from the end of the tube, and the body of the

adult mollusk is enclosed between two irregular-shaped valves, like an *Etheria*, with the tube and the valves of the young shell on the produced end of the attached valve. (See Proc. Zool. Soc.)

In *Humphreyia*, on the contrary, the small united valves are attached by their ventral edge, and they are extended behind into a free, ascending, subquadrangular tube, like *Vermetus*, which continues to grow in length as the animal increases in size.

The use of the tubules in *Aspergillum* and *Clavagella*, and of the minute perforations in the lower part of the tube of the genera *Furcella* and *Foegia*, has not been satisfactorily explained. They have been supposed to admit water to the front part of the body of the animal, and have been regarded simply as tubes or perforations, as if they were always open; but they can only be formed round the tentacles, and it is most probable that the tentacles fill up the tubular cavity during the life of the animal, though they are vacant, and the tentacles on which they have been formed are not to be observed in the specimens of the animal which are preserved in spirits. The admission of water to the front of the animal does not appear to be necessary for their œconomy, as such tubules or pores are not to be found in the tubes of *Teredo*, *Gastrochæna*, &c. In some *Clavagellæ* and *Aspergilla*, the tentacles and the tubules which cover them are branched and spread out, as if the mollusk wished to obtain a knowledge of the animals and other bodies in its neighbourhood. They may also serve to steady the tubes, as roots do trees, and prevent their being thrown down by the usual waves of the sea, as it is the kinds which live sunk a small depth in the sand that appear to have the tubules most extended; while those that are sunk deeper, or are fixed on rock, have only perforations in their place,—as trees which have their roots near the surface have them greatly extended horizontally.

It is to be observed, that when these animals have completed their tube, if they extend any more in size, it is only posteriorly in the length of their siphons; and then they extend the length of the shell by the addition of fresh portions to the siphonal end of the tube, as shown by the ruffles in *Warnea* and *Bryopa*.

IV.—On the *Spermatology of a new species of Nais*.

By H. J. CARTER, Esq., H.C.S. Bombay.

[With three Plates.]

THE following communication contains a description of the development of the spermatozoa in the ovisac with the ovum, in a

new species of *Nais*, together with other matter bearing on the origin of the sperm-cells both of the so-called testes and ovisac; also on the functions of the floating-cells of the peritoneal cavity, and that contractile body called by Dr. T. Williams the "segmental organ*;"—to which is appended a short summary of the changes which successively take place in the yolk during the development of the embryo, and the product which frequently results when the yolk fails to fissurate.

This information has been chiefly obtained from a perennial species of *Nais* that, for a year past, has colonized the sediment of a glass jar, in which *Chara* has been growing out of a little saucer suspended a short distance from the bottom; but not having afforded me any opportunity of following the development of the embryo, I have been obliged to take advantage of another species for this purpose, which I found in a gelatinous Alga (*Glaucocapsa*), collected during "the rains," for the microscopic *Filaria* that it also contains, and which species not only furnished me with eggs, but with other observations of a serial nature, that serve to complete those unsupplied by the first species.

Thus the facts contained in the following pages having been the result of investigations carried on under an unusual combination of favourable circumstances, attended with a microscopical examination of upwards of two hundred individuals, it is hoped that they will be found acceptable.

The text, however, is not the consequence of this labour more than the illustrations, which are as true to nature as circumstances would permit, and have been compiled from a great number of sketches taken from the objects themselves.

With these few remarks, let us proceed to the following descriptions of the two *Naides* to which I have alluded, which it is desirable to premise, that the reader may be familiarized with their specific and general characters respectively, before he commences the subsequent observations. They are, I believe, new; and the first that will occupy our attention is that species which has colonized the sediment of the jar of *Chara*, as it is this from which my information has been chiefly derived.

Nais fusca, H. J. C. (nov. sp.) Pl. II. figs. 1–3.

Filiform, of a pinkish-brown colour, subsegmented, setaceous; anterior extremity clavate pointed, posterior extremity slightly attenuated, obtuse; mouth inferior, a little distance from the anterior extremity; anus subterminal. Reproductive band near the head, commencing with the fifth segment. Cirri

* Ann. and Mag. Nat. Hist. vol. xix. p. 393, 1857.

ventral, in pairs in each segment throughout the body; each cirrus composed of 2-4 short, sigmoid, stiff hairs, suddenly inflated in the centre and bifid at the extremity. Setæ (fig. 4) in groups in pairs in each segment after the posterior border of the reproductive band, each group composed of 2-3 straight hairs, of which one is much larger than the rest, and equal in length to the breadth of the body. Œsophagus narrow, without distinct glands, expanding gradually into the intestine at the posterior limit of the reproductive band. Intestine wavy at first, afterwards straight, subsegmented, of a brown colour tinged pink by the vascular system, which contains red blood. Androgynous. Testicular sacs immediately in front of the reproductive band; oviducts and ovisacs under and posterior to it respectively; openings of the testicular sacs close to the anterior border of the reproductive band on each side. Spermatozoon (fig. 6 *b*) linear, straight, extremely narrow, with attenuated extremities, 1-160th of an inch in length. Segmental organ single, existing only in those divisions which are behind the reproductive band. Floating-cells of the peritoneal cavity spherical, colourless. Length of body when dry a little less than 1-5th of an inch.

Hab. Tanks and ponds of fresh water among soft, silky *Oscillatoria* and decomposing vegetable matter; breeding throughout the year.

Loc. Island of Bombay.

Obs. This worm, which belongs to the genus *Blanonais* (P. Gervais), is very like the figure of *Lumbricus tubifex* (pl. 34. fig. 4 *a*, Encyclop. Méth.), while the setæ of the latter more resemble those of the following species.

Nais albida, H. J. C. (nov. sp.) Pl. III. figs. 47, 48.

Filiform, colourless or white, obsoletely segmented; anterior extremity obtusely pointed, posterior extremity obtuse; mouth subterminal; anus terminal. Reproductive band a long distance from the head, commencing about the tenth segment. Cirrus and setæ (Pl. III. fig. 49) retractile, both composed of minute, short, straight, thick hairs, all alike and of equal length, three in the former and two in the latter, situated ventrally and laterally respectively, in pairs in each segment throughout the body. Œsophagus narrow, surrounded in its first part by four distinct glandular masses, then by hepatic cells, then becoming naked as it passes under the reproductive band, at the posterior border of which it expands into the intestine. Intestine at first wavy, and then straight to the anus. Androgynous. Testicular sacs indistinct, situated just in front

of the reproductive band; oviducts and ovisacs in bunches under and posterior to it respectively; openings of testicular sacs undiscovered, those of the oviducts ventral, and passing through the reproductive band. Spermatozoon (fig. 34) capitate, straight, the anterior third or head uniformly enlarged, twice or thrice the thickness of the rest, pointed; the posterior two-thirds gradually alternated to the extremity; total length 1-700th of an inch. Segmental organ double in each segment, with the exception of those under the reproductive band. Floating-cells of the peritoneal cavity colourless, oval, fusiform. Blood colourless. Length of body when dry, a little more than 1-5th of an inch.

Hab. Living and breeding in the portions of *Glæocapsa* which grow on the sides of gutters and old walls during the rainy monsoon only.

Loc. Island of Bombay.

Obs.—This species also belongs to the genus *Blanonais*, if it be not absolutely necessary for this, that the hairs of the cirrus should end in hooks.

Having thus premised the specific and general characters of these worms, the reader will be prepared to follow the other observations on them to which I have alluded. In doing this, however, it is desirable that he should remember that they will be entirely confined to *Nais fusca*, except where, for confirmation or to fill up *lacunæ*, it may be necessary to refer to those supplied by *N. albida*.

Integument.

The integument of *Nais fusca* may be stated to consist of two transparent, cylindrical sheaths or layers (fig. 3 *r, s*), of which the outermost is composed of cells, and the innermost without apparent structure. Within the latter, again, floats the alimentary canal (which may be viewed as a third cylinder) and the other internal organs of the body.

In the cells of the outer or dermal layer, there is nothing remarkable except the reproductive band (fig. 3 *t*), which especially claims our attention, because it will hereafter be seen to be developed in proportion to the presence of spermatozoa in the so-called "testes," and therefore may perhaps be found to furnish the sperm-cells of these organs.

This band seems to be merely formed by an hypertrophy or inflation of the dermal cells of this part, which, having become distended with vesicles filled with refractive matter (fig. 5), present individually the following composition from without inwards (fig. 5 *c*): viz. a delicate cell-wall, more or less partially

lined by a group of vesicles filled with refractive matter, resting on a central sphere equally refractive. There is also a nucleus present (fig. 5 *d*), which in all probability is held in position by a thin layer of endoplasm situated between the vesicles and the central sphere, and from which vital agent or primordial film all the rest of the cell has been produced. For the most part these cells are diffuent in form (5 *a, b*), but there are many which are spherical (fig. 7), and the latter average 2- to 3-5600ths of an inch in diameter. The refractive matter with which the vesicles are filled, as well as that which composes the central sphere, appears to be albuminous at first; but while that of the former, in the vesicles of the floating-cells of the peritoneal cavity, which will presently be seen to be identical to all appearance with the cells of the reproductive band, may pass into oil or spermatozoa, that of the latter disappears without further change, or becomes granular in a way which will be better understood hereafter. Certain it is, that the centre of these cells is composed of a solid sphere of refractive substance, which possesses sufficient tenacity to retain its form against the solvent action of water, even after being deprived of the cell-wall (fig. 5 *d*), and which sphere, we shall find by-and-by, in the floating-cells, affords nourishment to the spermatozoa during their development from these cells in the ovisac. We may safely infer, then, I think, that it contains the elements of both albumen and oil, which substances are developed in it at the expense of each other, according to the requirements of the case. Dr. Williams considers the albuminous centre of the floating-cells to be a fibrinous compound*. Thus, then, to recapitulate, we have the cells of the reproductive band composed of a cell-wall, a nucleus, and a number of vesicles surrounding an albuminous sphere, which thus occupies the centre of the cell.

Of the inner sheath or layer (fig. 3 *s*) nothing need be stated further than that it forms the chief skeleton-support of the body of the *Nais*, and may be muscular or fibrous, or both. It becomes separated from the cellular layer under the influence of a solution of bichloride of mercury, and thus may easily be demonstrated. Between it and the alimentary canal is the peritoneal cavity, in the "chylaqueous fluid" of which float the floating-cells, segmental organ, organs of generation, and a good part of the vascular system.

Alimentary Canal.

This (fig. 2 *a, f, f*) forms, as above stated, a third or central cylinder, suspended inside the second by the delicate loose por-

* Phil. Trans. part 2. p. 625 *et seq.*, 1852.

tions of membrane which compose the dissepiments or partitions of the body, and thus floats freely within this space throughout its whole course, becoming surrounded by the layer of hepatic cells only after it emerges from behind the posterior border of the reproductive band, that is, where the œsophagus ends.

Floating Cells.*

Throughout the peritoneal cavity, that is, from one end of the *Nais* to the other, are a number of spherical cells (fig. 3 *b, b, b*, and fig. 7), varying in size from 2- to 3-5600ths of an inch in diameter. Most of these are loose, hence the name of "floating-cells," while many adhere to the parietes of the peritoneal cavity through the plasticity of their cell-wall. In composition they are identical, as just stated, with the cells of the reproductive band; and therefore, to avoid repetition, the reader is requested to refer to the latter for this part of their description. How they are produced, I am ignorant; but they make their appearance in the young *Nais* before the hepatic cells and before the reproductive band. If they were reproduced by fission, one ought, among such numbers, to be able to see this taking place in all its stages; but such is not the case: it is true that two, three, or more are often seen adhering together, but this may arise from the plasticity of their coats. As they are seen of all sizes, however, it seems not improbable that their vesicles may sometimes become the young litter, and thus the supply may be kept up; or, indeed, they may be developed from the surface of the peritoneum, which thus acting as a basement-membrane, may have developed them from the commencement. When these cells are subjected to the influence of a solution of bichloride of mercury within the worm, their vesicles expand, burst, and become undistinguishable from the albuminous centre, while the nucleus, remaining, thus becomes distinctly visible (fig. 7 *c*): when also they issue into pure water, from a rupture of the body, the same changes take place; but when the internal vesicles have been formed for some time, or present a yellowish tinge, they remain unaltered; in which case the delicate cell-wall frequently disappears and leaves them adhering to the refractive albuminous sphere, which is just as tenacious as that of the cells of the reproductive band (fig. 7 *b*). Indeed, the composition of the whole cell, as before stated, is exactly the same.

Hepatic Cells.

These are spherical or diffuent in form (fig. 8), and composed

* For an account of these cells generally in the Invertebrate animals, and the "Chylaqueous Fluid" above mentioned, see Dr. T. Williams's excellent paper, Phil. Trans. 1852, p. 595. pt. 2.

of a cell-wall, vesicles, nucleus and albuminous centre, like the floating-cells, but with the following exceptions, viz.—that some of the “vesicles,” though retaining their original shape, have acquired a yellowish tinge; others have become of an amber-colour, and have flowed together to form bile-globules; while a third set have apparently shrunk into abortive, brownish, or colourless granules; many also of the hepatic cells have lost their cell-wall, thus leaving nothing but the parts just mentioned adhering to the surface of the albuminous sphere (fig. 8 a). The hepatic cells are so loosely attached to the intestine, that, under the slightest pressure, many of them separate from it, and may be observed free among the floating-cells of the peritoneal cavity, when the only difference that can be observed between those which are spherical and the floating-cells, is the yellow tinge of the vesicles: neither is there any earlier stage of development of these cells than this in the hepatic layer; hence it becomes a question, from whence are the hepatic cells originally derived?

To me, the hepatic cells appear to be merely the final stages of development of the floating-cells, for the following reasons: First, from there being no cells earlier in development in the hepatic layer than those of a spherical form, in which the vesicles are already tinged yellow, and in which state, but for the presence of this colour, they would be undistinguishable from the floating-cells. Secondly, from the hepatic cells being enclosed by no general membrane, but attached loosely to the surface of the intestine. Thirdly, from the plasticity of the cell-wall of the floating-cells enabling them to attach themselves to the intestine, as we have seen them adhering to one another and to the surface of the peritoneal cavity. Fourthly, from there being floating-cells in the abdominal cavity of many Infusoria, as well as in the stomach of *Planaria* and the Rotatoria, where the sequence of development from the young cell with uncoloured, to the older cell with coloured vesicles and bile-globules, is always present. And, lastly, from the free microscopic *Filaria* that have come under my observation, both from the salt- and fresh-water pools of the island of Bombay, having the abdominal parietes of the peritoneal cavity covered with biliary oil-globules as well as the intestine; showing that, if the latter are not derived from the former, both the abdominal as well as the intestinal layer of the peritoneum are capable of producing them.

If, then, we admit that the hepatic cells are derived from the floating cells of *Nais*, then these cells are homologous with the floating cells of the Infusoria, e. g. *Nassula*, *Prorodon*, *Otostoma*, &c.*

* See “Spherical Cells,” Ann. Nat. Hist. vol. xviii. p. 124, 1856.

With reference to the formation of the bile, it has already been observed, that the vesicles of the floating-cells may form a new generation; and it will also be seen hereafter that they, under other circumstances, may produce spermatozoa. Hence it might be inferred, that where neither of these developments take place, the endoplasm or vital part, which must be present with the oil, perishes; and that the former being thus lost, their oleaginous contents become subject to the laws of inanimate matter, and so more or less flow together, to form the large amber-coloured bile-globules which appear scattered over the intestine.

Segmental Organ.

This (fig. 2 *g* and fig. 3 *n*) is the name proposed by Dr. T. Williams* for a tubular organ that exists in almost all the segments, with the exception of those containing the generative organs, which, as this gentleman has also intimated†, are but mere modifications of it. In some species it is single, in others double (fig. 48 *h*), as will be seen by looking at the figures of the two *Naides* now under consideration.

In *Nais fusca* the segmental organ is single. It is absent in the segments before the reproductive band; attains its maximum size in those immediately behind it; and diminishes gradually towards the tail, where it almost becomes obsolete. Where best developed, it consists of an elliptical body and tubular portion. The former (fig. 3 *p*), which chiefly owes its size to a more convoluted state of the latter at this part, is situated on the right side of the body close to the anterior partition or dissepiment, through which its tubular portion is prolonged for a short distance, and then terminates in an expanded, slightly constricted, and margined mouth (*o*), furnished with long cilia. From this the tube passes back through the elliptical body, in which it becomes exceedingly tortuous, and after issuing from its posterior extremity, makes two sinuous revolutions round the segment, and then also ends on the right side (*q*), midway between the partitions of the segment, where it opens externally and ventro-laterally. Throughout, this tubular organ floats freely in the peritoneal cavity, except where it is fixed by passing through the partition, and where it opens externally; and throughout, also, it is imbedded in a fine granular substance disposed in lobes around it (into which, on one occasion, I *thought* I could perceive the branching-out of a vessel from the tube). The cilia round the internal opening are much larger than those which line the tube, and the movement of the former sluggish compared with that of the latter, which is very rapid; neither is there any par-

* Ann. and Mag. Nat. Hist. vol. xix. p. 393, 1857.

† *Idem*.

ticular direction manifested by the cilia of the internal opening, while that of those in the tube is distinctly backwards, or towards the external opening. What the direction of the contents of the tube may be, I have not been able to determine, for I have never seen anything pass through it; and the floating-cells in contact with the internal opening indicate no current at all, but merely displacement, when struck by the cilia. No current can be seen, either, at the external opening, when carmine is added to the water for ascertaining this; but the tube throughout becomes continually and gradually distended, and every now and then contracts suddenly, to empty itself, after the manner of the contracting vesicle and its tubular system in the Rotatoria and Infusoria, or perhaps, more particularly, in *Lacinularia*, where, according to Prof. Huxley, there is no "contracting vesicle*."

Of the use of this organ I am ignorant, but undoubtedly it is homologous with the "contracting vesicle" and its tubular system, both in the Rotatoria and many of the higher, if not in all the Infusoria. In *Nais fusca*, no current, as just stated, appears to pass into or out of either its internal or external orifice, although there is a rapid ciliary movement going on throughout the whole of the intervening tubular portion; this motion again appears to be from within outwards, from which it might be inferred that the contents of the tube take the opposite direction, and therefore that the fluid with which it becomes filled comes from without. If we direct our attention to the cilia which cover the rectal part of the intestine in *N. fusca*, &c., this movement is evidently from behind forwards, while it is equally evident that the contents of the intestine pass in the opposite direction; and again, if we watch the cilia on the sides of a *Planaria*, their motion will be observed to be towards the head, while the current produced by them, as indicated by the neighbouring particles, is distinctly backwards. This apparent contradiction, however, appears to derive explanation from the single cilium of some of the polymorphic Monads, which, undulating from the base towards the extremity, draws the surrounding particles towards itself, and thus the motion appears one way while the current is another†. Yet some of the larger Rotatoria, in which the contracting vesicle is also very evident, and opens freely into the cloaca, one would think ought to afford us means of proving whether the fluid with which it becomes distended really comes from within or without. I have, however, tried this, by placing carmine in the water with a large species of *Philodina*, but never could detect any in the distended

* Quart. Journ. Microscop. Soc. Lond. vol. i. p. 3, 1853.

† Annals, vol. xx. pl. 1. fig. 10.

vesicle; possibly the opening into it, though freely admitting water, might not be large enough to admit particles of carmine. Then, again, the facts which I have brought forward to prove that the "contracting vesicle" in the Infusoria is filled from the vascular system connected with it*, are also opposed to the view which I have assumed of the manner in which the tubular part of the "segmental organ" in *Nais* is filled; while the latter theory, after all, only rests on the inference that the direction of the movement in the cilia indicates the opposite in the direction of the contents. The question, therefore, is still open for inquiry. It is easy enough to see the large contracting vesicle in the rotifer *Brachionus* become distended and contract, and there can be little doubt that its contents pass outwardly; but the slowness with which it becomes refilled affords us no information as to where the fluid comes from; so that, before this is determined, it is impossible to say to which system this organ belongs, viz. whether respiratory or renal. At one time I thought, from the intimate connexion of the "segmental organ" in *Nais* with the generative system, whose organs, as before stated, are but mere modifications of it, and all equally contractile, that it was the rudimentary form of the kidney in higher animals; but subsequently observing the direction of the ciliary movement in the alimentary canal of *Nais* to be opposite to that of its contents, I am now inclined rather to consider its functions respiratory; at the same time, it is difficult, if this be the case, to conceive why it should have an internal opening—while, again, it is not always that the contents of the tube pass in the opposite direction to the movement of its cilia, as we shall see hereafter, viz. in the floating-cells of the peritoneum, which get into the ovisac through the so-called fallopian tube, which is but a modification of the tubular portion of the segmental organ in *front* of the elliptical body, and has the motion of the cilia in the same direction. Are the functions of this organ both excretory and respiratory? or, in short, what are its functions? and what is the use of the tubular part, and what that of the fine granular matter which surrounds it, respectively? I must leave future inquirers to determine, merely observing that the question is one of much interest, as the organ appears to me to be traceable through the "contracting vesicle" in Infusoria, even into the "vacuole" of the vegetable kingdom†.

* Annals, vol. xviii. p. 126, 1856.

† Since the above was written, I have distinctly observed the motion of the body-cilia of a species of *Spirostoma*, when under a slip of glass, to be whip-like, and the neighbouring particles to follow the *forward* movement of the lash, which of course is the most powerful; while the wave in the cilia in totality was also *forward*, quite contrary to that which is observed

Testes.

The so-called testes (fig. 2 *b* and 3 *d*) are situated immediately in front of the reproductive band, and consist of simple contractile sacs opening externally by a short duct (*d*) close to the anterior border of this band. They may be empty, or contain spermatozoa in bundles (*a, a*), the cause of which bundling will appear hereafter. With the spermatozoa are generally a number of loose, irregular, hard granules (6 *a*), and an albuminous mass, which will be seen, by-and-by, to be the effete remains of the spermatophorous elements. I have also observed cells (*c*) present in the anterior part of the sac, like those of the reproductive band and peritoneal cavity, but with some brown matter in each, which is particularly deserving of attention, because it will be found hereafter to mark the sperm-cell throughout. Lastly, in one instance, four small globular masses of granules (*d*), from which radiated, in all directions, attenuated linear bodies resembling the spermatozoa at an early stage of growth, were forced out from the testicular sacs; but beyond this, the so-called testes in *Nais fusca* have not afforded me any other stage in the growth of the spermatozoa, with the exception of the full development, although many scores have come under my observation. The fully-developed spermatozoon (fig. 6 *b*) is about 1-160th of an inch in length, linear, and so narrow that I have never been able to see its attenuated extremities satisfactorily with a magnifying power of 450 diameters.

It may now be asked, from whence the cells come, from which the spermatozoa are developed,—assuming that which will be proved hereafter, viz. that those cells which were observed in the testes with the brown matter in them were undoubtedly spermatogenic cells? In reply to which I can only state, that, much as I have sought for a duct in the so-called testis communicating with the peritoneal cavity (and much as, *à priori*, we might expect one to exist like that of the segmental organ (fig. 3 *o*) and the so-called fallopian tubes (fig. 3 *e'*) leading into the ovisacs, from the testicular sac and oviduct being but mere modifications of the segmental organ), I have not been able to find any; while the contour of the testes being so neatly defined, and the contents, on pressure, always escaping through the external orifice, leads me to the conclusion that there is none. Again, the testes being filled with spermatozoa only when the reproductive band is well developed, and empty and contracted when it is absent, leads one further to infer that the reproductive band is in some way connected with the testes; and that the cells of which it is

in *Planaria*, &c. The movement of the cilium in *Spirostoma* was precisely that of the line in fly-fishing.

composed, being to all appearance, as before stated, identical with the floating-cells (from which we shall by-and-by find the spermatozoa to be developed in the ovisac), have some means perhaps of getting into the testes by a channel as yet undiscovered, and there becoming subservient to the same purposes; for, as I have already observed, there are cells in the testes sometimes which bear all the characters of the spermiatic cells of the ovisac.

Thus the so-called testis appears to be a sac for holding the sperm-cells during the development of the spermatozoa, rather than for providing these cells; while, should the latter be derived from the reproductive band, this band would be more appropriately termed the testis.

Although, however, I have not been able to trace the development of the spermatozoa in the testes of *Nais fusca*, yet I have been able to do so in *N. albida* (Pl. IV. figs. 31-33); but as the process is the same as that which I shall have presently to detail in the ovisac, it is better not to go further here than barely to mention this fact.

Oviducts; Fallopian Tubes; Ovisacs.

The oviducts (fig. 2 *c* and 3 *f*) are elliptical, transparent, delicate sacs situated under the reproductive band, on each side of the median line; they have wrongly been called "uteri," for they are no more deserving of this name than the oviducts of a fowl. They are endowed with a motile power which manifests itself almost rhythmically, by sudden contraction, so that at first they look like large "contracting vesicles." Each has three apertures, viz. one (*g*) inferior, which opens ventrally, and may be termed the vaginal aperture; another, in the anterior extremity, which is continuous with the so-called fallopian tube (*e*); and the third in the posterior extremity, which is continuous with the ovisac (*h*). It is this saccular duct which probably holds the ovum for a short time, during the addition of the horny shell.

The so-called fallopian tubes (*e'*) are, again, wrongly named, because they do not convey the ova into the ovisac, but, on the contrary, as we shall see presently, convey the floating-cells of the peritoneal cavity into the oviduct, previous to their passing into the ovisac, where they become sperm-cells. They are simple tubular prolongations of the oviduct, which, passing through the partition of the preceding segment, thus become fixed in their position, and open freely into the cavity of the peritoneum close to the testes (*e*). Each tube is ciliated internally, and terminates in an expanded aperture, whose inner margin is also surrounded by a fringe of long, straight, coarse cilia. The direction of the motion of the cilia in the tube is backwards,

and very rapid, as in the tube of the segmental organ, while that of the long cilia round the mouth is comparatively slow, and indicates no more current among the floating-cells and other particles of the peritoneal cavity in juxtaposition, than those on the corresponding part also of the segmental organ. Nor have I ever seen any of the floating-cells in the fallopian tube, though frequently in the oviduct (fig. 3 *f*). It is this instance of the floating-cells passing into the oviduct *with*, instead of against, the movement of the cilia, to which I alluded when speculating upon the functions of the segmental organ.

The ovisacs (fig. 2 *d* and 3 *h, h*) are also extremely delicate, transparent, contractile bags, which, commencing by a narrow neck from the posterior end of each oviduct, extend backwards to the second and third segment behind the reproductive band, where they terminate in round extremities; beyond this there is nothing remarkable in them when empty, except that they are enveloped and partly supported, as they float in the peritoneal cavity, by long loops of the vessels termed "the branchial system" by Dr. Williams in *Nais filiformis**, but which here are evidently of great service in affording nourishment to the ovum and the sperm-cells when they are undergoing development in the ovisac.

Ovary.

We must assume here, as in many similar cases that however thin and attenuated the ovisac may be, the inner surface of its posterior extremity can furnish a point or particle which may become an ovicell; and, for reasons which will be better understood by-and-by, that the ovicell which it can thus produce is composed of a cell-wall lined by a layer of endoplasm, in the periphery of which is the nucleus, consisting of a nuclear cell and nucleolus; that the nuclear cell is filled with endoplasm charged with several points or nuclei, which become surrounded by, or develop around themselves, as many cells; and that finally the nucleolus perishes, and leaves these cells alone, or rather enclosed in a delicate membranous envelope (the nuclear cell expanded?). Thus we obtain a group of ova, (fig. 9 *c*) which, whether developed in the way mentioned or not, make their appearance under this form, free and detached from the surface of the ovisac. In general there is only one of these groups present; but there may be two (fig. 9 *c*), or even three. Each ovum of the group is, as usual, composed of a cell-wall lined or filled with endoplasm, and bearing in one part the nucleus or "germinal vesicle," which consists of a diaphanous cell whose cavity forms the "transparent area," in which again

* Report of the British Association for 1851, p. 183.

is the nucleolus or "germinal spot." There is seldom more than one ovum at a time in an appreciably advanced stage of development (fig. 10 *d*), and, if there be two, one is much more so than the other (fig. 11 *d*, *e*).

As the ovum, in process of development, increases in size (fig. 10 *d*), yelk-granules are developed in its endoplasm,—in fact, the endoplasm becomes the yelk; the germinal vesicle enlarges; it also presents an endoplasm in its interior, that is, in the "transparent area," in which several distinct granules or points appear (fig. 11 *f*), that become respectively the nuclei of so many new cells (fig. 12 *f*), and when the latter are nearly formed, the germinal spot or nucleolus perishes (*g*). The ovum now appears to have attained its largest dimensions (fig. 11 *d*); but the next stage, viz. the disappearance of the germinal vesicle and the liberation of its contents, I have not witnessed. It is from the germinal vesicle undergoing these changes that I have assumed the single ovicell to undergo similar ones, prior to the development of the "group" of ova; that is, that those of the germinal vesicle are but a repetition of what have occurred in the first ovicell. How far I am right in this matter, is left for others to decide. I would here also remark, that the granules or cells of the yelk appear to be multiplied by that process of cell-formation called "budding" (fig. 51), so beautifully seen in the little *Lemna*-like *Physodictyon* (Kz.), and the so-called "ferment-cells," and that it bears a close resemblance to that which I have described in the "ovules" of *Spongilla** and *Euglena*†.

[To be continued.]

X.—On the Winteraceæ. By JOHN MIERS, F.R.S., F.L.S. &c.

THE only two genera belonging to this small group that were known in the time of Jussieu, were placed by that celebrated

* Annals, vol. xviii. p. 231. pl. 6. fig. 39.

† *Idem*, vol. xx. pl. 1. fig. 16. Since my description of the "Ultimate Structure of *Spongilla*" was published in this volume, I can of course no longer regard the germs in the spherical cells of the "capsule" as "ovules," but as the contents of these cells, which themselves are the ova,—each spherical cell in totality producing an "ampullaceous sac," which appears to me to correspond to the polype of a polypidom. This would make the "germs" analogous to the "yelk-granules" of the ovum of *Nais*, and hence also the analogous budding appearance. I have also described a similar budding in the cells of *Euglena viridis* (*l. c.*), and there is something like this again in the production of the oleaginous and amyliiferous cells(?) of the Diatomæ; while latterly it has struck me that these may be produced by a budding in the first instance from what I have termed the "glair-cell" (Annals, xviii. p. 241).

botanist, in his 'Genera Plantarum,' among the *Magnoliaceæ*,—an association which has been confirmed by most botanists since that time. DeCandolle, in his *Syst. Veg.* i. p. 548, first announced the opinion of Mr. Robert Brown (in 1818), that *Illicium* and *Drimys*, together with *Tasmannia*, should be classed in a separate family under the name of *Winterææ*,—a suggestion only partially adopted by the former botanist in his 'Prodromus' (1824), when he formed them into a tribe of the *Magnoliaceæ*, under the designation of the *Illicieæ*, a classification that has since been generally adopted. Dr. Lindley, however, in his 'Nixus' (1833), and in his 'Introduction to Botany' (1836), is the only one who appears to have carried out the suggestion of Mr. Brown in establishing this as a distinct family under the title of the *Winteraceæ*; but he subsequently abandoned this arrangement (in 1836), in his 'Vegetable Kingdom' (p. 417). M. Spach (in 1839), in the 'Suites à Buffon' (vii. 432), classed the *Winterææ* as a tribe of *Magnoliaceæ*, evidently with much doubt, as he stated distinctly that he considered that group more allied to the *Dilleniaceæ* than to *Magnoliaceæ* (*l. c.* p. 432). Endlicher (in 1838), after the example of Spach, classed the *Illicieæ*, in his 'Genera Plantarum,' as a tribe of the *Magnoliaceæ*, but expressed his opinion that they ought rather to rank as a distinct order, between that family and the *Dilleniaceæ* (*Enchir.* p. 428). Lastly (in 1855), we have the authority of the authors of the 'Flora Indica' (p. 72), who give it as their opinion that the *Winterææ* form a very questionable tribe of the *Magnoliaceæ*, and may with reason be separated from them, as soon as the systematic characters of other collateral groups are better established. Having already partially stated my own opinion on this subject*, when treating on the *Canellaceæ*, I will now proceed to mention the facts on which that conclusion is founded.

Although the *Winteraceæ* have unquestionably a considerable degree of affinity with the *Magnoliaceæ*, they are distinguished from them by several peculiar features: the latter are invariably signalized by very conspicuous and large vaginiform stipules, which fall off and leave a prominent annular cicatrice, like an articulation, round each node. In the *Winteraceæ* these stipules are entirely wanting. The wood, in the latter family, as well as in the *Canellaceæ*, and sometimes in the *Schizandraceæ*, contains vessels marked, like those of the *Coniferaæ*, with very distinct dots, which are not visible in the *Magnoliaceæ*. The bark, as also the foliage of the *Winteraceæ* and *Canellaceæ*, abounds in an aromatic principle, and the younger leaves exhibit many pellucid dots, which are less visible in an older state, on account of the greater thickness and opacity of the parenchyma: this cha-

* *Annals*, 3d Series, vol. i. p. 352.

racter is wanting in the *Magnoliaceæ*; or, if sometimes present, these dots are exceedingly minute and faint. In the latter family the several parts of the flower spring from a broad and highly conical torus, whereas this is extremely small in the *Winteraceæ*. In the latter group the ovaries are generally few, and always in a single whorl, sometimes reduced to two in number, or even solitary; in *Magnoliaceæ*, on the contrary, they are constantly very numerous, being arranged imbricately in many series upon a conical or almost cylindrical torus. The structure of the fruit in this last-mentioned family affords a very characteristic feature, generally consisting of a large cone or ball of many-seried aggregated capsules, more or less free, but sometimes forming a solid syncarpium; these capsules generally open by two valves, each exhibiting one or two tolerably large seeds (covered by a brilliant scarlet fleshy tunic), which fall out and remain suspended each by a long elastic thread: in the *Winteraceæ* the fruit is small, consisting of a few radiating carpels generally distinct; in *Illicium*, somewhat two-valvular; but in *Drimys* and *Tasmania*, baccate, enclosing a few small, shining, black, cochleate seeds, of a structure different from those of *Magnoliaceæ*, and remarkably similar to those of the *Canellaceæ*: the hard crustaceous tunic, hitherto mistaken for the testa, so conspicuous in the latter family and the *Winteraceæ*, presents a striking contrast to the scarlet soft tunic, suspended by a long thread, in the *Magnoliaceæ*: in the latter order the raphe is found in this external fleshy coating, while the tunic beneath it is thick, hard, and bony; but in the *Winteraceæ* and *Canellaceæ* the outer coating is hard, brittle, and void of vessels of any kind; the raphe is seen in the second tunic, which is thick, soft and spongy (analogous to the outer tunic of *Magnolia*), while the coating next beneath it is thin and membranaceous. The embryo, in the former order, is situated in the axis of the albumen, at the extremity farthest removed from the hilum, and beneath the apical chalaza: in the two last-mentioned families, the embryo is excentrically placed near the rostrated summit of the albumen, at no great distance from the hilum, and at a more considerable interval from the lateral chalaza. There can be little doubt, therefore, that the *Winteraceæ* have far less affinity with the *Magnoliaceæ* than they have with the *Canellaceæ*; and it appears to me that the reasons here given fully justify their removal from the station hitherto assigned to them, and their approximation to the last-mentioned family, in the manner I now proceed to indicate.

The circumstances that seem to connect the *Winteraceæ* with the *Schizandraceæ* should not be lost sight of in this investigation. There are certainly many points of affinity between them;

but some incompatible features are seen in the monœcious character of the latter order, and the trimerous arrangement of the parts: we must, however, remember that in *Tasmannia* there is an approximation in this respect; for if its flowers be not monœcious, they are often polygamous; and although *Drimys* generally does not agree with *Kadsura* and *Sphærostemma* in its parts being always in threes or multiples of three, we find these numbers in *Illicium*, and sometimes in *Drimys*; while, on the other hand, *Schizandra* differs from its congeners in having a pentamerous disposition. There is also in the *Winteraceæ* a tendency towards the *Schizandraceæ*; for though *Tasmannia* has only one or two, or sometimes four ovaries, and *Drimys* six to eight, *Illicium* has at times as many as eighteen distinct carpels,—but then, it must be remembered, they are always uniserial. There is also much similarity in the structure of their ovaries, that is to say, they are unilocular, with few ovules attached parietally to the ventral suture. The fruit in both orders is baccate and few-seeded, the seeds being reniform, somewhat small, with a crustaceous shining external tunic, and a short internal raphe along the sinus, together with an extremely small embryo imbedded at the extremity of the albumen near the hilum, having very minute cotyledons in proportion to the radicle. The *Schizandraceæ*, like the *Winteraceæ*, have alternate exstipulate leaves, which are equally distinguished by numerous pellucid dots; and I have before alluded to the peculiar dotted vessels contained in the wood of all these three families. In *Schizandra*, the stamens are united into a dilated tube or disk, and *Canella* offers some analogy with this; but the principal line of distinction that marks the group of the *Schizandraceæ* lies in its monœcious flowers, and in the multiserial disposition of its distinct and numerous carpels. Notwithstanding the well-marked characters that tend to separate these orders, enough has been shown to prove their near affinity.

The *Schizandraceæ* by some botanists are held to be merely a tribe of the *Magnoliaceæ*; but I have pointed out many of the characters that keep them distinct from the latter, and that place them in contiguity with the *Winteraceæ*. It is not possible, in any linear arrangement, to form so perfect an approximation of genera as by the circular system; but the nearest conformity is obtained by interposing the *Menispermaceæ* and *Lardizabalaceæ* between the *Anonaceæ* and *Magnoliaceæ*, and by the intervention of *Schizandraceæ* between the last-mentioned family and the *Winteraceæ* and *Canellaceæ*; by this disposition we form a chain of regular gradation, the links of which sufficiently harmonize together. Keeping thus the *Winteraceæ* in the relation best adapted to them, after all the other families of the *Polycarpicæ*,

and placing the *Canellaceæ* at the head of the *Rheades*, to which class, from their carpellary structure, they must belong, we thus maintain uniformity in the systematic arrangement, without disturbing the chain of linear gradation that naturally exists between these families.

The genera of the *Winteraceæ* have a wide geographical range. *Drimys* is distributed over all equinoctial South America, Mexico, the more temperate regions of Chile, the Strait of Magellan, and New Zealand. *Tasmannia* is met with in Australasia and Borneo, while *Illicium* is found in tropical Asia, Japan, and North America; and the coincidence may be remarked, that the *Schizandraceæ* exist only in the last-mentioned three distant regions. *Canella* has hitherto been met with only in the Antilles and the northernmost point of the South American continent, while *Cinamodendron* is found on the very margin of the southern tropic of Brazil, as well as in the West Indies. The *Magnoliaceæ* are natives of many parts of India, of tropical South America, and the United States; and I believe there is no instance of the occurrence of any of the above-mentioned families in the continents of Europe and Africa. The *Lardizabalaceæ*, however, are found in the tropical parts of Africa and Asia, and also in extra-tropical South America, while the *Menispermaceæ* have a general cosmopolitan distribution.

I will now proceed to offer a few remarks upon the several genera of the *Winteraceæ*, and give an amended character of each, as far as my own observations extend.

1. DRIMYS.

This genus has been described by several botanists, more particularly by St. Hilaire, who enters into many details of its structure*. One of its peculiar features is in its calyx, which, in the bud, forms one entire valveless covering, and at length bursts into two concave segments, more by a laceration of the tegument than by any distinguishable commissure: it is deciduous. Its lanceolate petals are distinct to the base, and are variable in number, being sometimes only five to eight, when they are uniserial; in other cases they vary from ten to sixteen, when they are biserial; and not unfrequently they are as many as twenty-four, when they are in three whorls: they are white, and also deciduous. The stamens likewise vary in number, being generally very numerous, and arranged in one to seven whorls, of five to eight in each whorl, somewhat increasing in length, the inner series being longest: they are all short, less than one-sixth the length of the petals, and seated, together with

* Pl. Usuelles, 5. pl. 26-28.

them and the ovaries, upon a very short stipitiform gynobase. The ovaries, which are variable in number, from five to eight, are always free, uniserial, and erect; they have no sensible style, the short umbilicated stigma being sessile upon the ventral side of the conical and somewhat gibbous ovary, just below its apex, from which point a ridge extends to the base: they are always unilocular, with a single placentiferous line upon the ventral face, corresponding with the ridge just mentioned. Upon the edges of this band are arranged about sixteen ovules, in eight collateral series, extending from the stigma to the base of the cell, each reniform ovule being suspended from its sinus by a short funicle. The ovaries ripen into as many small pear-shaped berries, each containing ten or fewer seeds, closely packed in a thin pulp, which possesses a very aromatic taste and smell. The seeds are densely black, very polished, obtusely rostellated above, swelling below in a somewhat reniform or cochleate shape, with a small concave hilum beneath the summit, to which the short funicle is attached. The outer shell is thin, hard, and brittle, formed entirely of short, transverse, crystalline cylinders, without vessels of any kind: the next tunic beneath this brittle shell is of a spongy texture, and of cellular structure, the cells being filled with coloured aromatic oily matter; it is covered by a thin pellicular reticulated membrane, inside of which, and adhering intimately to it upon its ventral side, there is seen a very distinct thick cord of some length (a raphe), consisting of a bundle enclosing spiral vessels, which cord extends from the hilar point to a dark spot (the chalaza) situated just below the deep sinus: again, within this coating, there are two very distinct reticulated membranes, which, by the medium of a small quantity of intervening glandular matter, become somewhat adherent together; these integuments are homogeneous in all parts, except where they are thickened at the chalazal disk just mentioned. The enclosed nucleus consists of a mass of fleshy albumen, within which, close to the hilum, is found a very minute embryo, of a short cylindrical form, rounded obtusely at each end, that directed towards the centre of the albumen having a very short but distinct cleft, indicating two minute cotyledons. St. Hilaire states that this embryo is entire, and that, after careful examination, he could not detect in it any trace of cotyledons*. I have invariably found, on the contrary, in the seeds of *Drimys Chilensis*, the very distinct cleft above mentioned. St. Hilaire also describes the radicle as protruding beyond the albumen: I have not found this to be the case; although there is an appearance of such an occurrence, when the thin portion of the albumen that covers its extremity breaks away by its

* *Loc. cit.* p. 7.

adherence to the inner integument, if the latter be not very carefully removed. The embryo is surrounded by a small quantity of glutinous juice, and from the cotyledonary cleft is seen a narrow tubular membrane, longer than the whole embryo, extending along the axis of the albumen, and which, no doubt, is the remnant of the embryo-sac.

We can have little hesitation in referring to their proper denomination the different seminal tunics above described. On a former occasion* I have entered into a lengthened discussion upon the structure of the several coatings of seeds in general, and have shown that their nature can always be determined with certainty by the position of the raphe in regard to them; it has been demonstrated that any integument exterior to that which bears the raphe must be of a growth subsequent to the fertilization of the ovule, and therefore extraneous to, and distinct in its nature from those resulting from the growth of the proper tunics of the nucleus; and that such coating, be it membranaceous, thick, fleshy, coriaceous, horny, or osseous, must be arilliform in its origin. Judged by this rule, the black, hard, brittle shell of the seed of *Drimys*, hitherto considered as its testa, would be an arillus; and the spongy coating in which the raphe is imbedded is that condition which I have called an arilline†, or growth of the primine into the state of a thick fleshy integument.

The genus *Drimys* consists of evergreen trees of moderate size, possessing a hard wood, the bark of which is extremely aromatic in smell and taste, whence the species peculiar to Chile bear there the name of Canelo, the bark of which is called Canela, the Spanish word for cinnamon. The leaves are alternate, generally glaucous beneath; the inflorescence, sometimes axillary, is usually terminal, often in aggregated one-flowered peduncles, and frequently these peduncles bear on their summit a number of one-flowered pedicels, aggregated in form of an umbel, with a row of involucreated bracts at their base. With the exception of one, peculiar to New Zealand, and another growing in the island of Juan Fernandez, the plants of this genus are restricted to the continent of South America, one only extending into the northern hemisphere. *D. Granatensis* appears in the mountainous districts of the western tropical portion of the continent; a few distinct forms inhabit Brazil, while others are extratropical, *D. Winteri* confining itself to the Patagonian extremity of Chile. Sir W. Hooker, many years ago‡, seemed disposed to merge *D. Chilensis* into the Magellanic species, on account of the similarity of their leaves; and more recently,

* Linn. Trans. xxii. p. 81.

† *Ibid.*

‡ Bot. Misc. iii. 134.

Dr. Hooker*, after examining the many species of *Drimys* collected in various parts of the whole American continent, gave his opinion that all of them, including the one from Mexico and that from the island of Juan Fernandez, are mere varieties of *D. Winteri*. To this opinion I cannot subscribe, for reasons I will here offer; nor can I agree with St. Hilaire, that the different Brazilian forms which he describes† are only varieties of *D. Granatensis*. There is certainly a great uniformity of general appearance among the individuals throughout the genus, for, in all, the leaves are quite smooth, thick, entire, oblong, polished, veinless, with an inferior glaucous or whitish surface; but there is a certain character among them, by which, without mistake, we may assign to each the country of its origin. There are, however, in each of these several groups so many modifications of form, as well in the leaves as in the inflorescence, that it is almost impossible to offer good specific characters for them. I think it better, therefore, to take the middle course, and regard such individuals as so many varieties, and to consider each group as a distinct species, for which a clear diagnosis may be established. Under this point of view, the species will consist of the New Zealand form, *D. axillaris*, the Magellanic tree, *D. Winteri*, the Chilian *D. Chilensis*, and that from the region of the Ecuador, *D. Granatensis*, in which I would include the Mexican variety; I would establish *D. Brasiliensis* for the different Brazilian forms enumerated by St. Hilaire, with the exception of *D. montana*; to these may be added two other distinct species, here proposed, from Southern Brazil; completing the list by *D. Fernandeziana*, from the island of Juan Fernandez.

The younger Linnæus, who received specimens of *D. Granatensis* from Mutis, concluded it to be a variety of the Magellanic species‡; but Lamarek first pointed out§ the forcible distinction between them, and Bonpland subsequently confirmed this by farther observations||. These botanists showed that in *D. Winteri* the flowers are always solitary upon several simple peduncles, which are aggregated at the termination of the branchlets; while *D. Granatensis* is strongly characterized by each of these peduncles invariably bearing upon its summit three to five long umbellated pedicels, severally supporting a flower. *D. Chilensis* partakes of this latter character, and is therefore equally distinct from the Magellanic species. The general resemblance in the shape and size of the leaves in *D. Winteri* and *D. Granatensis* is certainly great; they have also the same dark green hue, with a more dealbated under surface, and a similar deep red

* Flor. Antaret. ii. 229.

† Linn. fil. Suppl. 269.

|| Pl. Æquin. i. 208.

† Pl. Usuelles, tab. 26, 27, 28.

§ Dict. Encyc. Méth. ii. 330.

midrib and petiole—so much so, that if the character of the inflorescence were put aside, they might be considered varieties of the same species: the inflorescence, however, constitutes a good specific difference, which is constant in each. Between *D. Granatensis* and *D. Brasiliensis* there is not only a dissimilarity in the appearance of the leaves, which in the former are more narrowly cuneated at the base, and of a much darker hue, but the inflorescence is distinguished in the former by its very long peduncles, its more lengthened and fewer pedicels, its larger flowers with a greater number of petals, and, finally, the inflorescence is axillary as well as terminal, which gives it a prominent character. *D. Chilensis* is subject to as many varieties in the size of its leaves, and the greater or less abundance of its inflorescence, as *D. Brasiliensis*; but there is a perceptible difference in the size and number of the pellucid dots which correspond with the raised glands upon their upper surface: in *D. Brasiliensis* and all its varieties they are comparatively larger and more distant; the leaves are far more coriaceous and opaque, so that in most instances the raised glands cease to be pellucid, and sometimes are wholly immersed: in *D. Chilensis* and in *D. Winteri* the punctate dots are much smaller, and more densely approximate. It is always easy to distinguish, at a glance, the difference between the two last-mentioned species: in the latter the branches are angular, invariably of a dark red colour, that gives it a peculiar character; the petiole is very much stouter, considerably shorter and broader, rugose, and darker coloured; the nervures of the leaves are fewer, and are soon lost by entire immersion in its much thicker parenchyma; while in *D. Chilensis* the petiole is longer, proportionately narrower, the nervures are closer, at least double in number, more conspicuous, and arcuately conjoined long before they reach the margin. I have already mentioned that in *D. Winteri* the inflorescence constantly consists of a few terminal simple peduncles, each bearing a solitary flower; but in *D. Chilensis* the peduncles are as numerous, are longer, broadly compressed, and always bear on their summit six or seven umbellated pedicels, each supporting a flower, and these are surrounded at their base by a verticil of deciduous bracteoles; where there are seven pedicels, this involucre consists of six bracteoles; and with six pedicels it has five bracteoles. In *D. Granatensis* this umbel is formed of only three to five pedicellated flowers, and the bracteoles are far more deciduous. In *D. Winteri* the calyx is larger, and the petals shorter and broader in proportion, seldom exceeding six in number; while in *D. Chilensis* I have always found ten petals: the former has usually four ovaries, the latter generally five. These differences, added to their general aspect, and their distinct geogra-

phical distribution, appear to me sufficient to establish the validity of these several species nearly as they are described by DeCandolle and other botanists.

The plant from Juan Fernandez I consider to be specifically distinct; and I find another, from extratropical Brazil, with smaller and very narrow, almost linear leaves, and terminal flowers on simple peduncles, which is certainly different from *D. Brasiliensis*; and likewise a third, of remarkable aspect, collected by Claussen in the province of Minas Geraës, to which Dr. Hooker* alludes, as being a singular state of *D. Granatensis*; but it ill-accords with that species, on account of its inflorescence, and its smaller and excessively revolute leaves. I have referred to *Tasmannia*, for reasons that will be given, the species from the island of Borneo, *D. piperita*, placed in this genus by Dr. Hooker.

I may here remark, that some of the species (more especially *D. Granatensis*) have a disposition to produce what gardeners call double flowers; in the variety *Mexicana* of that species there are usually twelve petals, which are sometimes increased to twenty-four in number†.

The anthers in *Drimys* are generally described as being dorsally attached to the broad filament, but this is not the case; the two cells are quite separate, and affixed by a median line to the margins of the filament, which margins are reflected outward, so that the anther-cells are thus approximated, and thrown into an extrorse position. In farther proof of this, I may here mention that I have sometimes met with a stamen half-transformed into a petal, in which case the anther-cells are widely separated, and attached to each margin of the petal, a little below the middle.

I propose dividing the species into four sections, distinguished by the simple or umbellate, either terminal or axillary flowers, and suggest the following emended character from my own observations.

DRIMYS, Forst. Wintera, Murr.—*Flores* hermaphroditi. *Calyx* in alabastro clausus et indivisus, demum lacerato-partitus in segmentis 2–3 concavis, reflexis, deciduis. *Petala* 6 ad 24, oblonga vel lineari-lanceolata, 1–3-seriata, calyce 3–4-plo longiora, toro subcylindrico cum staminibus insita, patentia, decidua, æstivatione apicibus replicatis imbricata. *Stamina* plurima (15 ad 40), indefinita, pluriseriata, hypogyna, brevissima; *filamenta* compressa, crassiuscula: *antheræ* 2-lobæ, lobis ovatis, sejunctis, subdivaricatis, ad margines versus apicem filamenti utrinque affixis, vix extrorsis, linea longitudinali

* Flor. Antaret. ii. 230.

† DeC. Syst. i. 444.

2-valvatim dehiscentibus. *Ovaria* 5–8, distincta, summo tori uniseriatim affixa, ovata, gibba, unilocularia: *ovula* plurima, reniformia, e placenta solitari parietali, ventrali, medio funicula brevi, biseriatim appensa. *Stylus* subnullus. *Stigma* parvum, breve, pulvinatum, umbilicatum, infra apicem latere ventrali situm. *Baccæ* 4–8, distinctæ, oblongæ, gibbæ, carnosæ, summo tori elevati sessiles, 1-loculares. *Semina* in quaque 3–10, cochleato-reniformia, hilo apicali punctiformi horizontaliter suspensa: *tunica externa* (arillus) dura, crystallino-crustacea, subfragilis, nitida, atra, nucleum valde gibbum et crasso-virgulæformem claudens: *tunica intermedia* (arillina) crassiuscula, celluloso-spongiosa (*raphide* conspicuo chordiformi sigmoideo ab apice usque ad chalazam percursa), et ad *integumentum tertium* membranaceum adhærens; *chalaza* lateralis versus sinum spectans: *integumentum quartum* membranaceum, reticulatum. *Embryo* in verticem albuminis carnosi copiosi minutissimus, breviter cylindricus, utrinque obtusus, *cotyledonibus* brevissimis, *radicula* hilo proxima, supera.

Arbores sempervirentes in America, a Mexico usque ad Fretum Magellanicum et in insulis Mari Pacifici crescentes, cortice aromatico; folia exstipulata, alterna, integerrima, coriacea, glaberrima, subtus sæpius glauca, pellucido-punctata, petiolata; flores pedunculati, aggregati, e gemma acuminata foliolis convolutis cito deciduis orti, sæpius terminales, rarius axillares, pedunculis aut unifloris, aut apice pedicellis plurimis umbellatis floriferis imo bracteolatis gerentibus, bracteolis involucrentis parvis caducissimis.

Div. 1. *Pedunculi plurimi, aggregati, axillares, 1-flori.*

1. *Drimys axillaris*, Forst. Gen. 84. tab. 42; DC. Syst. i. 443; Prodr. i. 78; Hook. Icon. 576; Hook. fil. Fl. Nov. Zeland. i. 12. D. colorata, Raoul, Pl. Nouv. Zél. 24. pl. 23.—Nova Zelandia.

This is admitted on all hands to be a good species, concerning which there is nothing calling for remark, except that I accord with Dr. Hooker in considering Raoul's plant as specifically identical with it.

Div. 2. *Pedunculi axillares, umbelliferi, pedicellos 3, rarius 7, bracteolatos 1-floros gerentes.*

2. *Drimys Granatensis*, Mutis, Linn. fil. Suppl. 269; DC. Syst. i. 444; Prodr. i. 78; H.B.K. v. 53. D. Mexicana, Moç. et Sess. DC. Syst. i. 444; Prodr. i. 78. Vintera Granatensis, Bonpl. Pl. Æquin. i. 205. tab. 58;—foliis oblongo-lanceolatis, imo cuneato-angustioribus, summo subacuminatis, co-

riaceis, opacis, marginibus nitidis revolutis, superne lucidis, fusco-viridibus, inferne granuloso-incanis, granulis creberrimis porosis, nervis pluribus tenuibus sese arcuatis vix distinguendis, costa media rubella paullo prominenti, petiolo longiusculo semitereti, angusto, canaliculato; floribus axillaribus, e pedunculo sæpissime folii fere longitudine, ancipiti, pedicellis 3-5 longissimis, umbellatis; petalis 10-12; staminibus 30-40; ovariis 10-12. — In Nova Grenada, Columbia et Mexico. — *v. s. in herb. Mus. Brit.* Santa Fe di Bogota (Mutis), (Dombey); in *hb. Hook.* Bogota (Turner et aliis), Columbia, Mexico (Hartweg, 444).

Folia 3-4½ poll. longa, 9-21 lin. lata; petiolus 5-9 lin. longus; pedunculus sæpius 2-3 poll. longus; umbella rarius foliifera; pedicelli sæpius 3, graciliores, compresso-trigoni, 1-1½ poll. longi. Calyx in alabastro globosus, rutiliter 2-partitus; petala sæpius 12, biseriata; stamina crebra, brevissima, 3-serialia, gynophoro inserta; ovaria sæpius 12*.

A specimen in the British Museum, collected by Dombey in Santa Fé (de Bogota?), though only fragmentary, exhibits a more than ordinary amount of development: it consists of two loose leaves and one loose umbel; the leaves are 5-5½ inches long, 2 inches broad, on a petiole 8-9 lines long; the peduncle is compressed, a line broad, and 3½ inches long, bearing on its summit two leaflets and five pedicels; the leaflets are obtusely obovate, cuneate, 1¾ inch long, including a petiole of 1 line, and the pedicels are 1¾-2 inches long; the flowers expanded are nearly 1¼ inch in diameter, the petals being 6 lines long, 4 lines broad, and rounded at their summit. The total inflorescence is nearly 7 inches in length, or 1 inch longer than its unusually large leaves.

3. *Drimys montana*. D. Granatensis var. *montana*, *St. Hil. Pl. Us.* 3. tab. 28; — ramis teretibus, foliis congestis, cuneato-oblongis, apice obtusis et sæpe subemarginatis; marginibus crassis valde revolutis, coriaceis, supra lucidis, nervis parallelis omnino immersis, subtus pruinoso-albidis, nervis vix distinguendis, costa media rubella valde prominenti, petiolo longiusculo canaliculato; inflorescentia axillari et terminali; pedunculis subtenuibus, compressis, folii fere longitudine, simplicibus vel interdum 2-3-fidis, et tunc pedicellis illis brevioribus. — Brasilia; Serra Negra in Prov. San Paulo (St. Hilaire). — *v. s. in hb. Hook.* (Claussen) ex Minas Geraës.

Folia 1½-2½ poll. longa, 6-9 lin. lata, petiolus 4 lin. longus;

* A drawing of this species is given in the 'Contributions to Botany,' pl. 27 A.

pedunculus $1\frac{1}{4}$ – $1\frac{1}{2}$ poll. longus; pedicelli 6–10 lin. longi; petala 10–15, linearia, acuta, 3 lin. longa, 1 lin. lata; stamina circiter 40, 3-serialia; ovaria 6; baccae 3, gibboso-oblongae, 2–3 lin. longae.

This I consider to be a distinct species, evidently allied to the following, and it differs from *D. Brasiliensis*, not only in the size and form of its leaves, but in its axillary inflorescence, and in the number of the parts of its smaller flowers.

4. *Drimys retorta*, n. sp.;—ramis teretibus, junioribus subangulatis, transversim rugulosis; foliis lanceolato-oblongis, apice obtusis et valde emarginatis, imo cuneatis, marginibus subito spiraliter revolutis, paginam inferiorem hinc fere celantibus, crasso-coriaceis, enerviis, superne nitidis, viridibus, in costam sulcatis, subtus subochraceo-pruinosis, costa media prominula, petiolo sulcato, marginibus involutis; inflorescentia axillari, umbellata; pedunculo brevissimo, crassiusculo, aut sæpe obsoleto; pedicellis 3–6, elongatis, gracillimis, sub-3-gonis, folio subæquilongis, erectis; petala 10; stamina 30; ovaria 5, quorum sæpius 2 abortiva.—Brasilia, in Prov. San Paulo (Bowie); Prov. Minas Geraës (Claussen)*.

Folia 1 – $1\frac{1}{2}$ poll. longa, limbo utrinque convolato 2 – $2\frac{1}{2}$ lin. diametro, maceratione expansa 4 – $5\frac{1}{2}$ lin. lata; petiolus 4 lin. longus; pedunculus in axillis $\frac{1}{2}$ lin. longus; pedicelli fere filiformes, $1\frac{1}{4}$ poll. longi; calyx clausus, oblongus, apiculatus, $1\frac{1}{2}$ lin. diametro, ruptiliter sub-2-valvis, segmentis concavis, 2 lin. longus, demum delapsus, et tunc pertusus circa pedicellum trajectus; petala 8–10, linearia, 2-seriata, $2\frac{1}{2}$ lin. longa, 1 lin. lata, mox decidua; stamina circiter 30, brevissima, 3-serialia; baccae 3, gynophoro cylindrico insitæ.

This is evidently allied to the former species: *D. montana*, however, is readily distinguished by its leaves, which are but little revolute on their margins, and are almost obsoletely emarginated in the summit; it has very lengthened peduncles, which are even longer than its somewhat stout pedicels, and it differs also in the greater number of its petals (12 to 15).

Div. 3. *Pedunculi plurimi, aggregati, terminales, 1-flori.*

5. *Drimys Winteri*, Forst. Gen. 84. tab. 42; Lam. Dict. ii. 331; DC. Syst. i. 443, Prodr. i. 78; Hook. Fl. Ant. ii. 229. *D. punctata*, Lam. Dict. ii. 330, Illust. tab. 494. fig. 1. *D. aromatica*, Desc. Ant. i. pl. 40. Winterana aromatica, Sol.

* A figure of this plant is shown in the 'Contributions to Botany,' plate 25 B.

Wintera aromatica, Murr. *Syst.* 507; Willd. *Sp.* ii. 1239; Bonpl. *Pl. Æquin.* i. 209;—ramulis subangulatis, fusco-rubris; foliis oblongis, utrinque attenuatis, apice obtusiusculis, supra nitidis, enerviis, aut nervis vix distinguendis omnino immersis, subtus glaucis, costa mediana margineque cartilagineo revoluta rubris, petiolo crasso, semitereti, longiusculo, superne subsulcato; pedunculis terminalibus, simplicibus, confertis, elongatis, angulato-sulcatis, apice compressis, imo bracteis deciduis involucriatis; calyce majori; petalis 5-6, oblongis; ovariis 4, rarius plura.—In Patagonia et Tierra del Fuego.

Folia subtus e punctulis granulosis albis creberrimis glauca, 3-3½ poll. longa, 12-16 lin. lata; petiolus 6-10 lin. longus, crassus, imo amplior; pedunculus 1-1½ poll. longus; alabastrus 3-4 lin. diam.; petala 6 lin. longa*.

I may here observe, that Lamarck's drawing of this plant is defective, and that Sir Wm. Hooker's figure, described under the name of *D. Winteri* (Bot. Mag. 4800), must be referred to *D. Chilensis*, which I consider specifically distinct, for reasons already given.

6. *Drimys angustifolia*, n. sp.;—foliis elongato-vel lineari-lanceolatis, apice obtusiusculis, planis, marginibus recurvulis, opacis, superne haud rugulosis, nervis omnino immersis vix distinguendis, subtus pallide glaucis, petiolo marginibus tenuibus sese involutis hinc subtereti; inflorescentia terminali pauciflora, pedunculis simplicibus. — In Brasilia Australi: v. s. in hb. Hook. (Sello).

Folia subtus e punctulis granulosis ochraceo-albis creberrimis glauca, 2 poll. longa, 2½-3 lin. lata, petiolus 4-5 lin. longus; pedunculus 6 lin. longus, subvalidus; calyx in alabastro clausus, integer, ovatus, apiculatus, demum 2-partitus; petala 9, linearia, in æstivatione imbricatim inflexa; stamina 18; ovaria 5†.

This is another and still more extreme form than *D. retorta*, with which it bears some analogy. I have observed a variety of the same (which may be called *lanceolata*) with broader and more oblong leaves, rather obtuse at the summit; the limb flat, 1½ inch long, 3-3½ lines broad, with a petiole of the length of 3 lines: it is of Sello's collection, and is probably from the same region as the above; but as the specimen has no flowers, it is impossible to give its characters and proper place.

* A representation of this species is shown in the 'Contributions to Botany,' plate 25 A.

† A figure of this plant is given in the same work, plate 26 A.

Div. 4. *Pedunculi plurimi, aggregati, terminales, pedicellos plurimos umbellatos 1-floros gerentes.*

7. *Drimys Chilensis*, D.C. Syst. i. 444, Prodr. i. 78; Deless. Icon. i. 22. tab. 83; Gay, Chile. D. Winteri, Hook. (non Murr.) Bot. Mag. tab. 4800;—ramulis teretibus; foliis oblongo-obovatis, versus apicem obtusum gradatim angustioribus, basi obtusiusculis et repente attenuatis, coriaceis, opacis, nervis plurimis, conspicuis, arcuato-nexis, et vix prominulis, supra crebre leviter granuloso-rugulosis, granulis sub lente puncto nigro signatis, punctis pellucidis, subtus e punctulis albis creberrimis glaucis, costa media prominente, margine cartilagineo recurvulo, petiolo valido subtereti canaliculato; pedunculis terminalibus 4–10, pedicellis 6–8 elongatis umbellatis e singulo ortis; petalis 10 linearibus; ovariis sæpius 5.—Chile.

Folia $3\frac{1}{2}$ – $4\frac{1}{2}$ poll. longa, 1 – $1\frac{1}{2}$ poll. lata, petiolus 5–6 lin. longus; pedunculi in apice ramulorum aggregati, 3–9 lin. longi, crassiusculi, compressi; pedicelli tenues 9–14 lin. longi, 4-goni; calyx 2-sectilis, laciniis æqualibus, ovalibus, concavis, pallidis, 2 lin. longis. Petala 10, linearia, expansa, 2-serialia, 5 lin. longa, $1\frac{1}{2}$ lin. lata. Stamina 35–40, exteriora breviora, interiora $1\frac{1}{2}$ lin. longa, 4-serialia. Ovaria 5, rarius 6, gibba, 2 lin. longa. Baccæ 5, pyriformes, purpurascens, 4 – $4\frac{1}{2}$ lin. longæ; semina circiter 12, cochleata, nitidissima, atra, in pulpam parcam nidulantia*.

There is a variety (*latifolia*) with much broader leaves, tolerably well represented in Delessert's 'Icones' (i. tab. 83),—but the petioles are too broad and flattened, the flowers much too large, and the petals too flat,—a specimen of which I find in Sir Wm. Hooker's herbarium, collected by Bridges; the leaves are $5\frac{1}{4}$ inches long, $2\frac{1}{2}$ inches broad, the petiole being 6 lines in length.

8. *Drimys Brasiliensis*. D. Granatensis in partem, DC. Syst. i. 444; Prodr. i. 78; St. Hil. Pl. Us. tab. 26, 27;—foliis oblongis, acutiusculis, aut obtusis, basi cuneatis, supra nitidis, leviter granuloso-rugosis, granulis concoloribus, subtus (excepto margine revoluti et costa media prominenti) albido-glaucis, opacis, crasso-coriaceis, obsolete nervosis, petiolo longiusculo, canaliculato; inflorescentia terminali, pedunculis ancipitibus, longiusculis; pedicellis sæpius 3, rarius 5, umbellatis, compressis, longulis; petalis 12, oblongis, acutis; ovariis 5–7.—Brasilia†.

* A figure of this species, with full generic details, is given in the 'Contributions to Botany,' plate 26 c.

† A drawing of this species is shown in the same work, plate 25 B.

Folia 3-4½ poll. longa, 1-1½ poll. lata, petiolus 6-9 lin. longus; puncta pellucida quam in præcedenti majora et sparsiora; petala biserialia; stamina crebra circiter 40 brevia; gynophorus cylindricus longiusculus. Variat magnitudine foliorum et abundantia florum.

a. var. *campestris*, *St. Hil. loc. cit.* 1. tab. 26.

β. var. *sylvatica*, *St. Hil. loc. cit.* 3. tab. 27.

γ. var. *axillaris*, *St. Hil. loc. cit.* 3.

9. *Drimys Fernandezianus*, n. sp.;—foliis in apice ramulorum confertis, lanceolatis, utrinque paullo acutis, acumine obtusiusculo, superne nitidis, confertim granulosis, granulis porosis, subtus e punctulis albis crebris minutissimis incanis, nervis tenuibus utrinque immersis, vix prominulis, longe intra marginem sese arcuatis, costa media crassa, prominenti, rubescente, glabra, superne sulcata; petiolo brevissimo, lato, rubello, subamplexicauli; floribus terminalibus, umbellatis, pedunculis elongatis, plurimis, confertis, rubellis, valde ancipitibus; pedicellis 6, gracilibus, longiusculis; petalis 8; ovariis 8.—In Insula Juan Fernandez.—*v. s. in herb. Hook.* (Bertero, n. 1453; Cuming, n. 1328).

Folia 3-3½ poll. longa, 6-11 lin. lata, petiolus 1½ lin. longus et latus; pedunculi terminales plurimi, conferti, 9-12 lin. longi, valde compressi, striati, pedicellis vix breviores, tenuiores; calyx 2-partitus, imo demum circa gynophorum circumscissus, et in pedicello trajecto delapsus; petala 8, linearia, pellucido-punctata; stamina 40 et ultra, in seriebus 4 disposita; antheræ subextrorsæ; ovaria 8*.

It is stated in the 'Flora Antarctica,' p. 229, that this plant quite conforms to that collected in the Organ Mountains of Rio de Janeiro by Gardner (his No. 5675); this latter plant was also found by myself in the same locality, and I made a drawing of it on the spot; but I do not perceive the same resemblance between them. There is a striking difference in the length of the petiole, which, in the Brazilian plant, is three or four times the length, and only half the breadth of the other; it has much stouter peduncles, and pedicels of only half the length of the other, their number being only three in the Organ Mountains plant, and six or seven in that from Juan Fernandez; the former has twelve petals and six or seven ovaries; the latter usually eight petals and eight ovaries.

[To be continued.]

* A drawing of this species is given in the 'Contributions to Botany,' plate 27 B.

VI.—Note on some Specimens of *Cypræa* (Cowries) from the Sandwich Islands. By Dr. J. E. GRAY, F.R.S., V.P.Z.S. &c.

THE British Museum has lately received, from Mr. Pease of Honolulu in the Sandwich Islands, a small collection of marine shells, among which there are a number of specimens of Cowries (*Cypræidæ*), all more or less differing from the usual normal condition of the species.

The peculiarities may be separated under two heads.

I. Many specimens, instead of being of their usual colour, are much paler, nearly white, with the markings which are characteristic of the species very pale and indistinct, or in some cases entirely obliterated.

Specimens with this peculiarity occur of the following species:—

1. *Cypræa caurica*. Very pale; margin pure white, very obscurely spotted.

2. *Cypræa cruenta*. The back with three slightly marked, broad bands, the purple spots on the margin scarcely indicated, and the usual orange colour of the mouth only forming a pale yellowish tint between the teeth.

3. *Cypræa fimbriata*? The back white, with three very obscure, interrupted, broad, brown bands; the base white; the margin with a few small, pale brown, round spots; and the apices of the aperture without any indications of the usual purple spots.

4. *Cypræa Gascoini*. Much paler than the specimen originally described, being very pale dirty yellowish, with regular circular white spots; the base white, with a few small brown dots on the upper edge of the margin. One specimen is pale yellowish white, with very obscure, almost imperceptible indications of the round whiter spots on the back.

II. The second series, instead of being of their usual colour, are of a more or less deep and bright pellucid yelk-yellow colour, with the markings that characterize the species in other localities more or less completely obliterated.

As, for example,—

1. *Cypræa sulcidentata*. There was only a bad specimen of this species in the collection; but I have seen other specimens, sent at the same time from the same locality, which are of a very bright orange-yellow colour, almost as bright and deep as a fine-coloured orange living *Cypræa aurora*.

2. *Cypræa arenosa*. Much yellower and more pellucid than usual.

3. *Cypræa Isabella*. More pellucid than usual, with the black marks very distinct and large.

4. *Cypræa Helvola*. Of a pale yellow colour, with white

margins; the darker spot of the back very obscurely indicated. There were only two, in a large series of specimens, in which these marks were distinct, and in them they were paler than usual. The base very pale yellowish, rather darker between the teeth of the aperture.

5. *Cypræa staphylæa*. The larger number of the specimens of this species are bright orange-yellow, polished, and without any of the usual white tubercles. Some of them have an irregular white blotch on each side.

Some specimens have more or less distinct small white dots on the back, in place of the tubercles; one large specimen has these spots very slightly raised, thus approaching the normal state of the species.

With these shells were sent—

1. *Cypræa Madagascariensis*, in the usual state of the species.

2. *Cypræa staphylæa*. A small, very dark-coloured variety, of a uniform pale brown colour on the back, with numerous minute white dots; the base white, with yellow-edged teeth, and some dark brown lines on the upper edge of the margin of each end of the shell.

I have no materials to explain the cause of this absence and alteration in the usual colour of such a number of species of shells belonging to a single family. As far as I have observed, the peculiarities are restricted to the species of this group; the shells belonging to the other families that were sent with them being of their normal colour. The specimens, I may observe, are of the usual size and form, and are easily determined by comparison with specimens from other localities.

VII.—*A Notice of Nature-Printing of Sea-weeds on the Rocks in the vicinity of Stromness, Orkney.* By CHARLES WILLIAM PEACH*.

I BEG to lay before the Society a most interesting fact of true nature-printing of sea-weeds which I met with in August 1856, immediately below the ruins of the ancient episcopal palace of Stromness. I was examining on the sea-shore the charnel-house in which lie the skeletons of the ancient denizens of the waters of the Old Red Sandstone period; my attention was engrossed by their numbers and variety, and the beauty of the sculpture of the black shining wings and dermal covering of the *Pterichthys*, the "berry upon bone" cuirass of the *Coccosteus*, the fluted and polished spears and delicately fretted mail of the *Diplacanthus*,

* Communicated by the author; having been read at the last meeting of the Royal Physical Society of Edinburgh, on the 28th April 1858.

and the burnished and spotted portions of the *Dipterus*, *Diplopterus*, *Osteolepis*, &c. &c., and then the large nail-bone of the gigantic *Asterolepis*,—all unmistakeable “footprints of the Creator,”—these, with the scaly *Lepidodendron* and other land-plants, all causing me to look back on past ages. Willing as I might be to muse and ask myself questions, I was not long able to do so; for in my movements I came upon rocks of a different character and hue, on which were portrayed pictures of recent plants, well known to me. I might have drawn on my imagination, and fancied that some one, well skilled in drawing, and willing not to be idle, having found a stretch of flattened rocks prepared for the purpose, had traced, with no “prentice han’,” some of the Algæ of our shores, with a light yellowish colour on the dark ground, and had succeeded so well, that at once I was able to name the genera and species, quite as readily as if the plant itself had been displayed on paper and presented to me for examination by one of the lady-algologists who reside in Pomona, and who, by their persevering and laudable industry, have earned the best wishes of all naturalists, by adding so largely to their knowledge of the beautiful “sea-flowers” which had so long blushed unseen on these rich and interesting shores,—now, happily, many no longer unseen; of this I had ample evidence in the splendid collections so kindly shown to me by several of the lady collectors. I greatly regretted that my legitimate work, the looking after the fossil land-plants, would not permit me to examine them so carefully as I could have desired; for amongst them I saw many species which hitherto I had only seen on the southern shores of England.

I found that these pictures occupied large spaces; some of the slabs were covered with them, two or three feet in length by half as much or more in breadth; the best are from one-third to one-half between the tide-marks. *Desmarestia ligulata* is the predominant form, with *Desmarestia* (*Dichloria*) *viridis*, &c. I saw that *D. ligulata* was very plentiful; a great quantity of it was lying on the rocks, in various stages of decay,—no doubt making more pictures where it rested. The form on the slab herewith sent, compared with the specimen spread on paper, will show that there is no mistaking the die used for the medal. If the slab is examined at the paper point, *Dichloria viridis* will be found pretty well defined. After I had detached this slab and one or two smaller pieces, my time was up, and I could examine no farther.

The stone I send (such is the case with many of the printed slabs) is coated by *Ralfsia verrucosa*, a leather-like Alga common on our shores; this coating may be likened to the chemical preparation in photography, the *Ralfsia* being the sensitive part to

be eaten away by its overlying corrosive brother. The impress is thus made, and the stone, when washed by the next flowing tide, is cleared of all the vegetable matter, both of the decaying *Desmarestia* and dissolved *Ralfsia*; the picture is then beautifully shown (fixed) on the light-yellow coated slab. Not only does the *Desmarestia* destroy the *Ralfsia*, it also dissolves some of the rock; and thus, as well as the depression left by the washing-out of the Alga, it is engraved in the stone; and probably this depression is added to, time after time, by the carbonic acid in the sea-water, and thus the more indelible it becomes.

Even in rocks of a deep dark-grey colour, containing little or no lime, and on which no growing Alga is to be seen, the *Desmarestia* imprints its form, by extracting the colour; and, although not so distinct as the prepared one, it is often well defined. I saw such on the coast; and the lady of the Rev. Mr. Learmonth kindly showed me one, which a quarryman had brought, some years before, as a plant of the age of the Old Red Sandstone; it retained all the markings fresh. These rocks dip gently to the westward, and are exposed to the full sweep and terrific lash of the waves of the Atlantic.

The first, and I may say, only impress must be quickly done, for each returning tide would certainly remove the weed, and leave not a trace of the vegetable matter behind. When we take into consideration the well-known property possessed by the *Sporochneæ* of destroying other Algæ, we cease to wonder at the eating-away of the *Ralfsia*; the extraction of the colour and the dissolving the hard rock will, however, cause some surprise, and we naturally ask, what can this lithographic property be? This and many other questions must be passed, and the one uppermost attended to; for we are looking back upon the ancient periods in the history of our earth. I have seen, in most of our geological formations, plant-like forms "painted," or rather, "discharged," especially when cleaving the Devonian and Silurian rocks of Cornwall and the Old Red Sandstones of Scotland, and have been struck by their forms; for so much like plants have they appeared, that again and again have I found great difficulty in persuading myself that they were not so,—always pleading the absence of organic matter; and this was a sad stumbling-block, for not a vestige could be seen. Others have been equally perplexed. Our lamented friend Hugh Miller, after speaking of the now acknowledged land-plants of the Lower Old Red Sandstone of Caithness, at page 435 of the 'Testimony of the Rocks,' says, "I may here mention, that curious markings, which have been regarded as impressions made by vegetables that had themselves disappeared, have been detected during the last twelvemonth in a quarry of the Lower Old Red Sandstone near Huntley, by the

Rev. Mr. Mackay of Rhynie. They are very curious and very puzzling; but though some of the specimens present the appearance of a continuous midrib, that throws off, with a certain degree of regularity, apparent leaflets, I am inclined to regard them rather as lying within the province of the ichnologist than the fossil botanist." From never having seen any of my friend Mr. Mackay's "puzzling specimens," I am unable to give an opinion about them; but, from the tenor of the whole passage, of which I have only quoted a part, I should be inclined to give them to the botanist. The absence of organic matter, with the midrib and hard fernlike appearance, weigh greatly with me;—for, as with the fossil, so with the beautiful Stromness forms, no portion of the vegetable can now be seen. There is plenty of proof that the pictures now presented to your notice were made by plants. I tried, on my return home, the experiment of laying a piece of *Desmarestia* on a stone from the beach, and exposed it in the hot sun, keeping it moistened with sea-water; and although the plant was far gone in decay, and the stone not prepared, and also too pale and siliceous, I succeeded in getting a faint impress,—quite distinct enough to show that, with better materials, success would be certain. I have since ascertained that one of the lady algologists of Pomona, long ago aware of these markings, had succeeded fully, with the splendid materials there, in getting them delineated in the way I tried. One thing, however, we do know,—that land-plants, as well as sea-plants, existed in the Lower Old Red Sandstone period: as regards the former in Caithness and Orkney, it is only lately an acknowledged fact. Plants, principally of the sea, also existed in the Silurian period; and, as tides ebbed and flowed and the sun shone in both periods as now, why might not the Algæ be cast on their exposed and ripple-marked rocks, and their likenesses indelibly printed, and, on the next flowing tide, the type swept away, leaving no trace of organic matter behind? I wish most distinctly to be understood, that I do not insist on claiming *all dendritical markings* on and in rocks for the botanist, for I know that some of these doubtful markings are caused by infiltration, and very many by the sportive arborescent forms of minerals; add to these, those from the crawling of Crustacea, the wriggling of Annelides, and the tracks of the vegetable-feeding Mollusca, all playing their part in the puzzling drama. I must, however, after acknowledging all these, and striking the balance, still think there is a probability that the printing process has thrown off the greatest number.

I have delayed sending this to you, in the hope of finding some notice of such a process beyond the very short one which I forwarded, at the time of the discovery, to the British Associa-

tion for the Advancement of Science. I have never been able to find a word. I therefore venture now to trouble you, in the hope that it will become more widely known, and be the means of showing that it is going on in different parts of the globe.

I must request that the slab sent with this may be returned. I would gladly give it to a public museum. It is the only good one I have; and I see no hope of ever going again to the printing house at Orkney to get more.

Wick, April 12, 1858.

BIBLIOGRAPHICAL NOTICES.

The Wonders of Geology. By GIDEON ALGERNON MANTELL, LL.D. &c. Seventh Edition, revised and augmented by T. R. JONES, F.G.S. London: H. G. Bohn. 1857-58.

THIS work forms one of the re-issues of Mr. Bohn's scientific series, and from the favourable reception it has met with, as indicated by the number of editions it has passed through, may fairly be considered as a useful introduction to the study of geology. The groundwork of these volumes was derived from a series of lectures given more than twenty years since by Dr. Mantell, at Brighton, in an attempt at the time to establish a county museum and scientific institution in that town. The basis of the museum was to have been the original geological collection, containing upwards of twenty thousand specimens, from which the subjects for the illustration of the lectures were selected. This collection, the result of the untiring labour of many years, both in the field and in the cabinet, was not destined to remain in the county of Sussex, from whence the larger and more valuable portion was derived, and the physical structure and ancient natural history of which it was intended to illustrate. As is well known, the Mantellian museum, containing many unique specimens, was transferred to the British Museum, where they are fully displayed amongst the other treasures contained in the Palæontological department of the national collection. Dr. Mantell may be said to have lived through some of the phases of geological science, and was no mean contributor to its onward progress, whether we regard the nature of his scientific writings, or the character of his popular teachings. As a lecturer, Dr. Mantell was probably unequalled: abounding in information, clear and lucid in style, gifted with a poetic temperament, he never failed to interest and instruct the audiences he frequently addressed. To him intellectual exertion was a relaxation rather than a fatigue: during the latter years of his life, and when in an impaired state of health, we have occasionally returned with him, after lecturing to some large assembly, and fully felt how his intellectual energies and poetic imagination have sustained him amidst much bodily suffering and mental anxiety.

The general nature of his lectures may be inferred from the work before us, and Dr. Mantell carefully revised every edition. The present or seventh edition is, however, considerably improved and augmented, and evinces much pains-taking and research,—the editor having spared no time or labour in working up the discoveries accumulated during the ten years that have elapsed since the previous publication, and which have been concisely but carefully incorporated in the present volumes. In fact, not only has much new matter been added, but many portions re-written and so far modified as to bring the work up to the present state of the science, and make it an exposition of the philosophy of geology. Copious notes are inserted, and numerous useful references given, so as to enable the reader to refer to any subject in a more detailed manner.

The original form of the work is retained—the division into eight lectures,—some of these, from their length, being again divided, and the subjects treated successively from the newer to the older deposits. The additional matter generally incorporated in each chapter contains all the more important and useful points of the science. In the Tertiary strata, the labours of Ed. Forbes and Prestwich as improving the classification of these rocks are fully given, more especially in the Isle of Wight district, and the foreign equivalents pointed out. Considerable improvements are effected in the part treating of the Cretaceous rocks, both as regards the fossils and the foreign range of these deposits. A concise account is given of the Foraminifera and Bryozoa, the editor giving his reasons for retaining the latter term instead of Polyzoa, used by some naturalists (p. 600). The importance of the Foraminifera in a geological point of view must not be underrated, independently of their remarkable forms and structure, as well as their endless varieties, which have exercised the skill and excited the admiration of collector and author. For much critical research on the numerous recent and fossil Microzoa we are indebted to the labours of Dr. Carpenter, Messrs. Williamson, Jones, and W. K. Parker.

The favourite subject of Dr. Mantell, the Wealden, is considerably improved, modified, and enlarged, the new facts connected with the Purbeck strata, arising from the researches of Ed. Forbes, Austen, and Fisher, being fully given. Much yet remains to be effected respecting the Wealden proper, both as regards the relative position of the strata composing it (we allude especially to the Asburnham beds) and also as to the physical geography of that period, whether fluvial or estuarine, whether the result of the action of one river or many rivers and small streams emptying themselves into an adjacent estuary, and their general direction,—a subject upon which the researches of Mr. Fisher and Mr. Godwin-Austen have thrown considerable light. Nor should we forget the labours of Messrs. Beckles and Brodie, whose discoveries have added so much to the peculiar mammalian fauna of this period.

In relation to the history of the Wealden, with which the name of Dr. Mantell must always be intimately associated, we cannot, however, forbear to notice the researches of Dr. Fitton connected with

the early inquiry respecting the true relations of the Wealden strata, and which are not perhaps so fully known as they deserve. To Dr. Fitton we are not only indebted for the term "*Hastings sands*," but also for pointing out their geological and palæontological relations to the other beds. In 1822 these sands were described as "*Iron sands*" by Dr. Mantell (*Fossils of the South Downs*, p. 24), and considered in one place (p. 37) to be separated from the Weald clay by the Tilgate limestone; while in another this limestone was identified with the Purbeck (p. 299), and is there presumed to have been protruded through it, where it is also stated, "whether they (the *Iron sands*) are of freshwater or of marine origin, has not been satisfactorily determined. The term "*Iron sand*" was also used by Buckland, Greenough, Conybeare, and Phillips; and it was "the sand and sandstone beneath the oak-tree clay" of Smith. Webster, in his '*Letters to Sir H. Englefield*,' described them as "*ferruginous sands*," including under this name also the Weald clay and Lower green-sand, and considered the Purbeck beds as constituting the lowest strata of the Isle of Wight. Dr. Fitton, in 1824, clearly pointed out that the two sands were distinctly separated "by a stratum of clay precisely corresponding, both in situation and in the fossils which it contains, with the Weald clay of Kent and Sussex. It is the *inferior of these sands alone* which is the equivalent of the *Hastings beds*; and these constitute the lowest formation visible in the Isle of Wight" (*Annals of Philosophy*, 1824, vol. viii. p. 367); and further, that the organized productions of the Lower greensand (Shanklin sand) were all *marine*, but those of the *Hastings sands*, almost exclusively, of *freshwater origin* (*ibid.* p. 379). Nor should the observations and deductions of Sir C. Lyell at that time be overlooked, respecting the order of the strata below the Chalk (communicated to Dr. Mantell, July 1822), and which are frankly acknowledged by Dr. Fitton.

Amongst the additions to the Secondary rocks, the notice of the extension of the bone-bed is an interesting feature. Some other points in the oolitic strata require further investigation, more especially as regards the nature, character, and equivalents of the Lower Oolites in the central counties of England: there are good reasons for believing that the slates of Stonesfield and Collyweston alluded to (pp. 510, 516) are not synchronous; they have few organic remains in common, and the Collyweston slates appear to be low down in the Inferior Oolite, or at least underlie beds containing some of the characteristic fossils of that stratum in the west of England.

The Trias and Permian are retained, as before, in one chapter, but their geographical extension is more fully described, and the researches of Murchison, Ramsay, King, and Howse, on these deposits noticed. The lecture on the Carboniferous system, upon which the editor has expended much time, labour, and thought, will be read with considerable interest, as containing new and important matter, clearly put and concisely arranged, so as to afford a general view of the structure, conditions, nature, and probable mode of accumulation of this important portion of the geological series; the student being especially referred to numerous valuable papers treating of the nature

and structure of coal itself, and also to the inquiries respecting the physical geography of the old carboniferous area, as treated of by Murchison, Elie de Beaumont, and more recently by Mr. Godwin-Austen, the observations of the latter bearing more immediately on the geological structure of the ground beneath London, in relation to the probable occurrence of some portions of the upper palæozoic series at less depths than is generally supposed.

The eighth lecture, in two parts, treats of the Devonian, Silurian, and Cambrian strata, as well as the nature of volcanic action and metamorphism, &c. In this part are some useful tables illustrative of the successive changes in the organic kingdom, the chronological appearance of certain classes and orders of animals, and of the rocks composed wholly or partly of animal remains. Much new and interesting matter is introduced in this chapter, and the researches of Sir R. I. Murchison and his early coadjutor, Prof. Sedgwick, fairly and fully acknowledged. The second edition of 'Siluria' of the former author is looked for with much interest; even in these volumes the editor has been kindly allowed to use some of the important facts and corrected classifications contained in that forthcoming work.

In conclusion, this edition of the 'Wonders of Geology' may be recommended as a useful manual to the student and general reader. We could have wished that some of the lignographs (41, 42) had been replaced, and, further, that the *mantle* of the late author had not fallen so heavily on the present editor, in his not curtailing the too frequent complimentary expressions to scientific friends. Science should be revered for its own sake; it has a reward, and the truth-loving spirit alone should be the stimulus in our finite attempts to vestigate the past wonders of Creative Wisdom.

Flore de l'Ouest de la France. By J. LLOYD. 12mo. Nantes, 1854.

This book, of fully 770 pages, includes the plants of Bretagne and the coasts of the Bay of Biscay to the north of the Gironde. It has much interest to British botanists, owing to the great similarity of the Bretagne plants to those of our south-western counties. The author possesses much skill in detecting the distinctive points of plants, and has usually so marked them by typographical arrangements as to render their separation from the long descriptions tolerably easy.

This book is very valuable and well deserving of attention. Its author is better acquainted with the doings of the botanists of other countries than is usual with those of France.

Flore du Centre de la France et du Bassin de la Loire. Third Edition. By A. BOREAU. 8vo. Paris, 1857.

The fact of this work having arrived at a third edition would have been a sufficient reason for considering it as deserving of attention, and an examination of its contents shows that it cannot be safely

neglected by those who are attached to the study of European plants.

The descriptive part of the work forms a volume of more than 750 pages. It is accompanied by a smaller volume consisting of an "Introduction," "Notions Élémentaires de Botanique," including a Glossary, a very complete "Clef analytique de la Flore," and "Propriétés et usages des plantes et étymologies de leurs noms."

The descriptive volume has the peculiarities, both advantageous and otherwise, which are usual in French Floras. The descriptions of both genera and species are very elaborate and most accurate; but the synonymy is almost wholly neglected, and the writings of foreign botanists seem to be little known to the author: German Floras are occasionally noticed, but those of England are scarcely recognized. There are no definite specific characters, and the reader is put to considerable trouble in order to discover the distinctions between the species; for the analytical tables are far from furnishing them, except to a very slight extent. This is a fault common to all the best modern Floras of France: indeed, that most valuable portion of the Linnæan system seems never to have established itself there. This defect must tend to the disadvantage of the French botanists; for many persons will not take the somewhat considerable trouble of discovering the characters upon which their species are founded, and thus they will suffer undeserved neglect.

M. Boreau announces in his Introduction that he belongs to that school which considers all permanent varieties as species (including, of course, cultivated plants), and consequently he admits a multitude of what many of our most eminent botanists call "false species." We incline to a middle course, believing that many of the plants pointed out by MM. A. Jordan, Boreau, and others, are really specifically distinct; but are nevertheless convinced that numbers of others have not the requisite constancy of character. For instance, we cannot believe that *Draba verna*, Linn., consists of nine species, with M. A. Jordan; nor of five, as recorded in the Flora before us. It is to be feared that in that case the Linnæan canon—that the genus or species shows the character, not the character the species—is too much neglected. Those who are accustomed to examine the minute external structure of plants have much reason for guarding themselves against this error, into which it seems natural for them to fall. But, on the other hand, those botanists seem to be at least equally in error who would neglect the more inconspicuous distinctions, and rashly, although perhaps conveniently for themselves and their believing followers, declare all plants between which they cannot find a good "paper" character, to be only varieties of each other. The reviewer believes that nature has specifically separated many plants which the acuteness of botanists has not succeeded in distinguishing by good definitions, and that we do not advance science when we decide authoritatively that the want of such definitions is conclusive against the existence of the species. He protests also, in common with our French contemporaries, against the modern doctrine, that a series of specimens from various parts of the world, such as are found

in the great herbaria, prove the identity of many so-called species. It is only the converse of a mistake often charged, rightly or wrongly, upon the school to which M. Boreau belongs. They are stated to describe species from single specimens; but they may return the compliment by announcing that their opponents combine them upon just as little evidence. For in what does a "series" of individual specimens—one from the Himalaya, another from Siberia, and a third from Europe, with a few more from other countries,—differ from so many single specimens of species? How can the writers know, in these cases, that they are not samples of plants presenting a constancy of character each in its own country? It is as rash to combine as it would be to separate them upon such imperfect evidence.

But we have perhaps occupied too much space with this matter, and run considerably away from the work proposed for consideration. We therefore conclude by recommending all earnest students of European, and especially British botany to obtain the "*Flore du Centre de la France*."

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

April 29, 1858.—J. P. Gassiot, Esq., Vice-President, in the Chair.

"On the Structure and Functions of the Hairs of the Crustacea."
By Campbell De Morgan, Esq.

The object of this communication is to determine, by the observation of their anatomical relations, the uses of the hairs and similar appendages to the shell of the Crustacea. The author mentions the observations of those who have of late specially investigated this subject. M. Lavallo noticed the connexion at times of the canals of the hairs with canals penetrating the whole thickness of the shell, and the *occasional* continuity of the matter which filled the hairs with that which exists in the corresponding canal of the shell. M. Hollard says that the canals of the shell which correspond to the hairs, are occupied by membranous investments, which embrace the base of the hairs, and seem to receive an extension of the nutrient system. He suggests that amongst other functions, the hairs may possibly be connected with that of general sensibility. Dr. Häckel in a recent publication has shown that the canals of the shell and hair are lined by a continuation of the outer layer of the soft internal integument, which he calls the chitinogenous layer. He describes minutely the structure of the inner integument, and his account on the whole agrees with that given by Milne-Edwards; but he does not recognize the presence in the canals, of any of the elements of the inner integument except the external cuticular or chitinogenous layer; nor the connexion of these canals with the corium which lies beneath it, and which receives abundantly nerves and vessels.

According to the investigations of the author, it is with this deeper,

vascular and nervous layer that the contents of the hair-canals and of the corresponding canals in the shell are especially connected. This can be readily seen in parts where the shell is thin, as in the foot-jaws for example. In a section made in such a situation, the canals leading to the hairs will be found to be often nearly as large as the bases of the hairs to which they correspond. They are lined by a thick membrane, which invests the cup-shaped cavity in which the hairs are implanted, and becomes so closely connected with the bulb of the hair itself, that it is often dragged out with it when the hair is pulled out. The cells and other elements of the deeper layer of the internal integument fill up the canal and pass on into the hairs.

Where the shell is thick, as in the claw of a lobster, the sheaths which are connected with the hair-bulbs and line the shell-canals can be demonstrated in the manner adopted by Mr. Tomes to show the existence of the dentinal fibres. If a section of a part of the shell or the claw where the hairs are implanted, and which has been previously softened in dilute acid, be torn through, the sheaths will usually be dragged out, and will be seen projecting from the torn edges, their contents often remaining in them. The connexion of the inner integument with these sheaths may be seen in sections of the claw with the integument still adhering to it, when on carefully tearing away the latter, its prolongations into the sheaths will be dragged out. That the hairs have some especial and important connexion with the inner vascular and nervous layer of the integument of the lobster's claw and elsewhere, seems probable from the observations made by the author on the contents of the claw. The terminal moveable piece, the pollex, and the prolongation of the metatarsus which it opposes, the index, do not contain muscular fibre, but are filled entirely by a soft pulpy mass of corium. The nerves of the limb are large, but only some small branches will be found to go to the muscles; the principal nerves pass on and terminate in the pulp which fills the opposing pieces of the claw. The author believes that it is the office of the hairs to establish a communication between the outer surface and this inner, and no doubt highly sensitive pulp, and that this is rendered still further probable by the comparison of the claws on the two sides. In the smaller claw the edges are sharp, and have fine tubercles along their margin; and the hairs are placed in a regular series of short tufts on each side of the tubercles, beyond which they do not project. But on the larger crushing claw, the tubercles are massive, and no hairs are seen projecting above the surface. If, however, a section be made, it will be seen that a communication is established between the inner pulp and the surface by means of an abundant series of canals which terminate in bulbous extremities, sometimes projecting beyond the surface, sometimes lodged in depressions in the shell. This arrangement may be found in other parts; and in the crab's claw, where the tubercles are deficient, these hairless pulp-cavities almost entirely replace the hairs.

Here, then, lodged within the densest part of the shell, is a structure richly supplied with nerves, shut off from other parts of the

body, and having communication with the surface only through the medium of canals, which are sometimes continued into short bristles, and sometimes terminate in mere bulbs. As a prehensile organ, the claw needs sensibility, but no force which the animal could exercise could make any impression on the parts within, through its dense tuberculated edges. On the other hand, it is difficult to assign any office to the bristles, and still more to the bulbs, mechanical or otherwise, unless it be that which has been suggested,—that, establishing, as they do, a communication between the external surface and the nervous structure within, they communicate impressions, and are in fact tactile organs.

The author had satisfied himself, before the appearance of Dr. Häckel's paper, that the hairs were connected with the inner layers of the corium, and not with the chitinous membrane only; and he had seen indications in the lobster and larger Crustacea of an arrangement of the pulp corresponding to the arrangement of the hairs. In the smaller Crustacea, especially in the shrimps, he found a remarkable confirmation of his views. In the flabelliform processes, and even in the claws in these animals, he found that the structures within the shell were arranged in the form of tubes corresponding to the hairs, through which passed from the deeper parts, fibres which were prolonged into the hair-canals. In the claw the nerve was traced to the inner termination of these tubes. The tubes in some instances merged internally into the general mass of the corium; in others they were truncated. Externally, or towards the margins, they presented open orifices, through which the fibres passed. The fibres, when drawn out from the hair-canals, often presented the plumose or serrated character, according to the form of hair to which they belonged. They could be traced for some distance down the tubes, and at times completely through them, but their deep connexions could not be clearly made out. Several modifications of this arrangement are described and figured. The author believes that the facts brought forward are sufficient to establish that the hairs of the Crustacea are probably organs by which external impressions are communicated to the internal sensitive parts.

May 6, 1858.—The Lord Wrottesley, President, in the Chair.

“On *Chondrosteus*, an extinct genus of Fish allied to the Sturionidæ.” By Sir Philip de Malpas Grey Egerton, Bart., F.R.S.

Before the conclusion of his great work on Fossil Fishes, Professor Agassiz recognized in some fragmentary remains found in the lias strata at Lyme Regis, unmistakeable evidence of the existence, at that period of the earth's deposition, of a representative of the still extant family of the Sturgeons. To this extinct fish he assigned the name *Chondrosteus*. The author of the present memoir has been enabled, by the examination of numerous specimens more recently acquired, to describe in some detail the external features of the fish, and the structural peculiarities of those portions of the exo- and endo-skeleton which have been preserved. In the former

respect the fossil differs from the recent sturgeon in having a shorter and deeper trunk, in the greater vertical expanse and wider divergence of the lobes of the caudal fin, in the median position of the dorsal fin, and in the absence of dermal plates on the back, belly, and flanks. Before describing the cranial anatomy, the author points out certain homologies between the head-plates of the recent sturgeon and the epicranial bones of the teleostean fishes, more especially with reference to the parietals, mastoids and frontals ; and explains that these conclusions have resulted from the examination of the inner table of the skull, where the relative position and proportions of the component plates are constant, however much the outer or dermal layer may vary.

The remainder of the memoir is devoted to detailed descriptions of such parts as are preserved in the several specimens ; and the author concludes by stating as the result of his investigations, that Professor Agassiz was right in referring the liassic fish to the Sturionidæ ; that in some respects it evidenced a transitional form between the latter family and the more typical ganoids ; that its food was similar to that of the existing members of the family, but that it was procured in a tranquil sea, rather than in the tumultuous waters frequented by sturgeons of the present time.

ZOOLOGICAL SOCIETY.

February 9, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

ON A NEW GENUS OF MYTILIDÆ, AND ON SOME DISTORTED FORMS WHICH OCCUR AMONG BIVALVE SHELLS. BY DR. J. E. GRAY, F.R.S., V.P.Z.S.

We have for several years had some specimens of large *Mytilidæ* in the Museum Collection which I have always regarded as the types of a distinct genus, but have deferred from time to time their publication, as I was informed that Dr. Dunker and others were engaged on a monograph of the family. Dr. Dunker having described the species without forming it into a group, I have therefore brought it before the Society, and at the same time make some observations on a peculiarity which the species presents.

STAVELIA, n. g.

Shell inequivalve, inequilateral, subtrigonal ; umbo anterior ; the front of the ventral edge sinuous, the flatter valve with a broad expanded lobe on the front of the ventral margin, the more convex one with a deep sinuosity to fit the lobe of the other valve. Anterior adductor scar distinct, oblong ; posterior roundish ; submarginal scar parallel to the edge of the shell, entire. Hinge toothless. Ligament and cartilage linear, marginal, rather short.

Periostraca laminate, with elongated flat linear or tapering processes.

This genus differs from *Mytilus* in the inequality of the valve and

the sinuosity of the lower edge, in the entire absence of any small teeth under the umbo, and in the paleaceous periostraca.

1. STAVELIA TORTA.

Mytilus tortus et *M. horridus*, Dunker, Proc. Zool. Soc. 1856; Reeve, Conch. Icon. t. 3. f. 6 & 9.

Hab. North Australia and Philippines.

I cannot discover any permanent character between the two specimens described by Dr. Dunker.

The specimens of this genus in the Museum, and others which have come under my observation, offer a peculiarity which I have hitherto only observed in a very few other bivalve shells, and in none to the extent which is presented in this species.

In my paper "On the Formation and Structure of Shells," in the 'Philosophical Transactions' for 1833 (reprinted by Dr. Johnston, 'Letters on Conchology,' p. 413), I observe,—

"In some very rare instances the shells (bivalves) are also reversed; but the fact is not easily observed except in the unequal-valved kinds. There were formerly in the Tankerville collection two specimens of *Lucina Childreni*, in one of which the right valve was a dextral shell, in opposition to the general structure. These specimens are now in the British Museum Collection."

The four specimens of this shell which I have under my eye present the same anomaly as the two specimens of *Lucina Childreni* above referred to, that is to say, two of them have the left valve the flattest and furnished with the large lobe on the front of the ventral margin, and in the other two it is the right valve which has this form and development; and I cannot observe any other peculiarity in the specimens except this indifference between the development of the sides of the animal. So that, as in *Lucina Childreni*, it is impossible to determine which is the normal form of the species. A somewhat similar indifference as to the direction of the shell is to be observed in some land univalve shells, as *Bulimus aureus*, where the shell appears to be indifferently dextral and sinistral; but in the genus *Stavelia* it appears more extraordinary on account of the great difference of the form of the two valves.

We have just received from China a large species of *Muteladæ*, allied to *Unio Grayii* of Lea, (which I do not name, as Mr. Cuming informs me that Mr. Isaac Lea is describing and figuring it in Philadelphia*), which offers a curious peculiarity.

These shells have the hinder extremity twisted up on one side somewhat like *Arca tortuosa*, but not so regularly; and unlike that species, the flexure is not always in the same direction: some have the bend towards the right, and the others towards the left of the animal.

I may observe, that, as far as I have been able to examine, the side seems a matter of indifference, for as many of the specimens are bent to the one side as the other.

* *Triquetra lanceolata* seu *contorta*, Lea.

It is to be observed that in *Arca tortuosa* and *A. semitorta* the hinge-line is always straight, and it is only the basal line which is bent to one side, the valves being slightly unequal, and in fact the shell is not distorted; while in the *Hyria* under consideration the upper edge of the shell is bent as well as the lower one, and the shell is truly altered in form by some external circumstance.

The shells appear as if they had been softened and suddenly twisted on one side. It has been suggested that this change in the form may be produced by the position which the shell occupies in the mud or under the stones near which it lives; but it is to be observed that *Uniones* generally live sunk in the mud, and not lying on one side, and that, like shells which live in an erect position, they have equal valves, while those that live lying on their side almost always have unequal ones; and if the form depended on this circumstance, as the animal must sometimes move and must be sometimes turned over, we ought to find some specimens with the flexure partly on one side and partly on the other, but no such specimens have occurred to me.

I am inclined to believe that it arises from some peculiar predilection of the animal itself, by which it probably more easily obtains its food in the peculiar situation in which it resides.

These shells were sent to England from China by one of Mr. Fortune's collectors. They were accompanied by some specimens of reptiles and insects, on which the Chinese collectors had been exercising their ingenuity in hopes of adding to their value. Thus there was a stuffed specimen of a Night Lizard (*Gecko Reevesii*) which had a square tuft of hair from some mammal stuck on the back of its neck.

A Snake, which had the claw of a mammal surrounded with fur inserted on each side of its neck just behind the head, so as to make it appear as if it had rudimentary feet armed with large claws.

Several of the Coleopterous insects, especially the larger *Cerambyces*, were painted, so as to give them quite a different appearance from the usual and natural colour of the species.

I may add that the work was so coarsely executed as to be discovered on the most cursory examination of the specimens, and could only have been intended to deceive the most ignorant collectors.

OBSERVATIONS ON THE GENUS *NERITA* AND ITS OPERCULUM. By DR. J. E. GRAY, F.R.S., V.P.Z.S., ETC.

The distinction of the species of this genus is rather difficult; therefore whatever assists in dividing the species into smaller groups is of use, as limiting the number of species between which any doubt can be entertained.

Considerable confidence has therefore been placed in the form of the surface of the inner lip, which in some species is smooth, in others tubercular or ridged, or both ridged and tubercular; but in examining a large series of specimens from the same locality, though the character is generally permanent, the tubercles or ridges

vary considerably in number and size, and are sometimes almost entirely wanting. It is to be observed that in many of the species which have this part tubercular, the tubercles are more distinct and crowded in the younger, and especially the youngest, than in the older, or what is usually called the more perfectly developed state of the species. In other genera such characters are generally more developed in the shells formed in the most perfect state of the animal. Mr. Adams has founded subgenera on characters furnished by the surface of the inner lip.

My studies on Mollusca have proved to me that few parts offer more important and better characters for the separation of the families, genera and species, than the operculum. This has been illustrated in the family *Neritidæ*.

The family is well characterized by the form of this part, and the possession of the internal apophysis or shelly lobe under the nucleus, forming a kind of hinge on the sharp inner lip of the shell.

In my paper in the 'Philosophical Transactions' for 1833, I stated that the structure of the operculum offered the best character to separate the *Nerita* from the *Neritina*, and I there observed, "The operculum of *Nerita* agrees in form with that of *Neritina*, but differs in having no cartilage on its edge, which is furnished instead with a groove in its outer surface, being covered with a thick, variously formed shelly deposit as in the genus *Turbo*, and in its inner surface being lined with a thick, callous, polished coat. Between the outer and inner coat there exists a very distinct concentrically striated horny layer, like the operculum of *Littorina*, and the left muscular scar is deeply grooved like that of the subannular operculum.

"This difference in the structure of their opercula forms an excellent distinctive character between these two genera."

In the same paper I observed, "The difference in the outer surface of the opercula of the genus *Nerita* affords a good character for the separation of the species."

I have lately had an opportunity of examining a large number of freshly collected *Nerites*, with their opercula dried in the mouth of the shell, so that there can be no doubt that they are the real opercula of the species, and that these opercula have not been put into the mouths of the shells at random, as is too often the case with shells which have passed through the hands of dealers*.

The species may be divided according to their opercula as follows:—

1. *Operculum polished, with a broad, slightly raised, concentrically grooved, submarginal band.* *Nerita*.

N. polita. Costal grooves arched (fig. 1).

N. lineolata. Costal grooves straight (fig. 2).

* In Adams's Genera of Shells, t. 42. f. 1, *a, b*, a granular operculum, probably that of *N. signata*, is figured as that of *Nerita polita*.

2. *Operculum polished, with a broad, slightly raised, granulated, submarginal band.* Ritenia.

N. plicata (fig. 3).

The specimens vary slightly in the distinctness, and especially in the breadth, of the tubercular submarginal band.

3. *Operculum with a broad, raised, convex, smooth, submarginal band.* Tenare.

* *Operculum smooth.*

N. Peloronta (fig. 5).

** *Operculum granular.*

N. ornata (fig. 4). The younger shells have the inner lip more granular, and the adult more ridged.

4. *Operculum uniform, granular, without any raised or distinct submarginal band.* Natere.

* *Inner lip granulated.*

N. exuvia.

N. Malaccensis.

N. albicilla (fig. 6).

N. Senegalensis.



1. *Nerita polita.* 2. *N. lineolata.* 3. *N. plicata.*
4. *N. ornata.* 5. *N. Peloronta.* 6. *N. albicilla.*

** *Inner lip ridged.*

N. variabilis.

N. Chamæleon.

N. versicolor.

N. tessellata.

*** *Inner lip smooth.*

N. signata. The granules large, in lines.

N. atra.

N. inconspicua.

The *Puperita pupa*, from the West Indian Seas, has an oper-

culum of a single coat, with a polished surface like *Neritina*. This genus, in the 'Guide to the Mollusca in the British Museum,' is by mistake put in the same section as *Nerita*, instead of that of *Neritina* (see p. 137).

February 23, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

NOTE ON THE SKELETON OF THE SHEATH-BILL (*CHIONIS ALBA*).

By T. C. EYTON, ESQ., F.L.S.

The general appearance of this skeleton is similar to that of the Plovers; the fissures on the posterior part of the sternum are, however, not quite so deep in proportion to its length, nor is the keel so broad, but its form is very similar, and distinct from that of other grallatorial birds. It differs from *Thinorchus* (with which I at first thought it might be allied) in having two fissures in the posterior margin of the sternum, *Thinorchus* having but one. On comparing the skeleton with some portion of the skeleton of *Glareola pratincola*, the bones are almost identical in form, particularly the sternum, head and pelvis. I should therefore be inclined to place *Chionis* and *Glareola* in the same family.

Mr. G. R. Gray arranges this form along with the *Thinorchinae* in his order '*Gallinae*;' Prince Bonaparte, in his '*Conspectus Systematis Ornithologiæ*' (1854), places it next to the Gulls, in the order '*Gaviae*.'

OBSERVATIONS ON THE GENUS *CUSCUS*, WITH THE DESCRIPTION OF A NEW SPECIES. BY DR. J. E. GRAY, F.R.S., V.P.Z.S., PRES. ENT. SOC., ETC.

Mr. Wallace having sent two specimens of this genus to the British Museum, to determine them I went over the previous observations on the genus, and examined the numerous specimens which are in the Museum collection, received from the French voyages of discovery, Mr. J. Macgillivray, the Naturalist of H.M. Ship '*Rattlesnake*,' and those now sent from the Island of Ula; and I have come to the belief that they are all to be referred to four species, which are very variable in the colour of the fur; one variable in both the sexes; another, in which the sexes differ greatly from each other, but appear to be permanent in their colour; one species in which the fur of the two sexes is alike and uniform in colour; and one, of which the female sex only is known, which is uniform iron-grey.

The two have the ears small, hairy on both sides, and hidden in the fur; the other two have larger ears, exposed beyond the fur and bald within.

M. Temminck, in the first volume of the '*Monographies de Mammologie*,' published in 1827, divides the short hairy-eared kinds into three species.

At the time he wrote he only had specimens from the northern part of Celebes, brought home by Professor Reinhardt, and from the islands of Banda and Amboyna.

The species evidently depend principally on the colour of the fur, which appears to be very variable in different individuals. It is true that he describes and figures skulls of the different individuals; but the difference between those of *Phalangista chrysorrhos* and *P. maculata* appears chiefly to depend on the age and development of the specimens figured. M. Temminck and the writers of his school always forget that the skull and other parts of the skeleton are liable to quite as much variation from local circumstances, food, and other accidental causes, as the colour of the fur or the size of the animal.

1. In *Phalangista ursina* the fur is thicker and closer, and the long hairs thicker than in the other species, blackish, with yellow tips to the longer hairs; and the forehead of the skull is flat. Of this he had several specimens of different ages, all brought by Professor Reinhardt from the northern part of Celebes, the natives of which have not observed any varieties in colouring.

2. *P. chrysorrhos* is described from two specimens brought home by the same Professor, from some of the Moluccas, which have a short cottony fur, of an ash-grey more or less black, and the rump and upper part of the base of the tail golden-yellow.

3. Of *P. maculata* Temminck particularly observes, that the fur in all ages and in both sexes is covered with irregular white or brown spots, which are paler and less marked in the young. The very young are sometimes entirely ashy. They come from Banda and Amboyna.

The yellow colour of the rump and the base of the tail, as far as the specimens in the British Museum show, is common to the ashy specimens, which might be called *P. chrysorrhos*, and the variegated specimens, which might be named *P. maculata*: it is very difficult to distinguish the pale-rumped ashy ones from those without that mark; but it is easy to connect the grey or ashy spotted ones with either the one or the other; and it is impossible to separate the ashy-grey spotted ones from the brown or orange spotted specimens. In one specimen the animal is nearly white, with some small dark spots about an inch over; and in another the animal is white, with red feet, and one large red spot on the middle of the back.

From the examination of the specimens in the British Museum, and of their skulls, I am inclined to believe that the *P. ursina* is distinct, and that *P. chrysorrhos* and *P. maculata* are varieties of the same species.

1. CUSCUS MACULATUS.

Ears almost hidden in the fur, clothed internally and externally with fur; forehead convex; forehead of the skull convex and rounded in front; grinders moderate; fur ashy-grey, or white and grey, or reddish, varied or spotted. Rump and base of the tail yellowish-white.

Phalanger, male, Buffon, H. N. xiii. t. 11.

Phalangista maculata, Desm. N. D. H. N. xxv. 472; Temm.

Monog. i. 14. t. 3. f. 1-6; Quoy & Gaim. Voy. Uran. Zool. 59. t. 7; Waterh. Mamm. i. 274. f. .

Phalangista ursina, part., Waterh. Mamm. 267.

Phalangista chrysorrhos, Temm. Monog. i. 12; Waterh. Mamm. i. 271.

Cuscus maculatus, Lesson & Garnot, Voy. Coq. Zool. 150. t. 4.

Cuscus macrourus, Lesson & Garnot, Voy. Coq. Zool. i. 156. t. 5; Waterhouse, Mamm. i. 277.

Hab. New Guinea.

Chrysorrhos would perhaps be the better name for this species, because all I have seen have the rump and base of the tail yellow, whilst some are not spotted.

Of this species we have in the British Museum—

1. Adult female, from the Moluccas, from the Leyden Museum, sent as *C. chrysorrhos*. Uniform ashy-grey; face, throat, chest, and beneath the rump and base of the tail yellowish.

2. Young female, from the south coast of New Guinea. Presented by J. B. Jukes, Esq. Dark blackish-ashy; head, neck and shoulders paler; rump and base of the tail reddish-yellow; cheeks, throat and beneath white; feet bright red.

The two sides of this specimen are not coloured alike. The forehead of the *skull* is very convex.

3. Half-grown "male from Darnley Island, brought from the south coast of New Guinea." Presented by J. Macgillivray, Esq. Reddish; back and thighs darker blackish-ashy; cheeks, throat, under side, large confluent spots on the sides, the rump and tail white; feet bright red. Like *Cuscus maculatus*, Quoy and Gaimard, Voy. Uranie, t. 7.

4. Half-grown "male from New Guinea." Presented by J. Macgillivray, Esq. Like the former, but white, with irregular large symmetrical pale reddish spots on body, limbs and tail.

5. Half-grown "female from Dufaure Island, south coast of New Guinea." Presented by John Macgillivray, Esq. Like the former, but white, with one very large reddish spot on the hinder part of the back; two large spots on the hind legs, and an obscured indication of a large patch on the shoulders; the feet red.

6. Half-grown, from the "island of Waygeroo." From M. Verreaux. Ashy-grey cheeks; back with some white spots; throat, chest, belly, rump and tail white; sides white, with scattered, round, nearly equal-sized spots; feet reddish.

7. Adult male. Aru Island. Sent by Mr. Wallace. White; body and limbs with small, roundish, rarely confluent, blackish-ashy spots; feet white: the skull has a very convex forehead.

Cuscus maculatus, Lesson, Voy. Coq. t. 4, is intermediate in colour and marking between Nos. 7 and 3.

Cuscus macrourus, Lesson, Voy. Coq. t. 5, from the island of

Waygeroo, bears a great similarity to No. 3; but the reddish spots are less confluent.

The figure of *C. Quoyi*, in Quoy and Gaimard, Voy. Uranie, t. 6, looks like a specimen of this species intermediate between the ashy and spotted variety, being ashy with darker obscure spots.

2. CUSCUS BREVICAUDATUS.

The ears hid in the fur, woolly internally and externally; tail short; the forehead —?; the front lower cutting-teeth broad.

Female uniform ashy-grey; rump and base of tail, throat, chest and belly yellowish dirty-white.

Phalangista nudicaudata, Gould, Proc. Zool. Soc. 1849, 110.

Hab. Cape York.

This species is only known by “a female two-thirds grown, sent from Cape York” to the British Museum by John Macgillivray, Esq.

It is very like the ashy variety of *C. maculatus*, but the front lower cutting-teeth are much broader, and the tail, which has the bones still remaining on it, is considerably shorter than any of our specimens of *C. maculatus*.

The specimen in the British Museum is that described by Mr. Gould.

Mr. Gould refers this animal to the subgenus *Pseudocheirus* of the genus *Phalangista*, and calls it *P. nudicaudata*, because it “differs from all the other Australian members of the genus in having the apical three-fourths of its tail entirely destitute of hair.” But Mr. Gould overlooked the fact that it is not a *Pseudocheirus*, but a *Cuscus*, all the species of which have the major part of the tail naked; and the species under consideration has the naked part of the tail, and indeed the tail itself, shorter than the rest of the species; so that the specific name of *nudicaudata* is singularly inapplicable.

The light mark on the rump, which Mr. Gould compared to that of the *Koala*, is also common to the species of *Cuscus*, and is probably produced by the habit of the animal sitting on its rump, rolled up into a ball, on the fork of the branches of trees.

The skull shows that the animal is much younger than the label indicates, as it appears only to have the milk teeth, and the broad lower incisors of the younger specimens of this genus. The skull differs both from that of *C. ursinus* and *C. maculatus*, but it is too young to predict what may be the normal form of the adult animal.

The front half of the space between the eyes is rather convex, but not nearly so much so as the young skull of *C. maculatus*; and the front of the forehead just behind the convexity described is rather concave; this concavity has no resemblance to the deep concavity occupying nearly the whole space between the eyes in *C. ursinus* and *C. maculatus*.

3. CUSCUS URSINUS.

Ears almost hidden in the fur, clothed with fur internally and externally; fur blackish-ash, with larger silvery hairs; head, throat

belly and tail rather pale brown; forehead flat, concave; forehead of the skull flat, deeply concave; grinders large, in a strongly-arched series.

Phalangista (*Ceonix*) *ursina*, Temm. Monog. i. 10. t. 1. f. 1-3; t. 2. f. 1-5, skull; t. 3, skeleton; Lesson, Cent. Zool. t. 10; Waterhouse, Mamm. i. 267, part.

Hab. Celebes.

We have in the British Museum only a single specimen of this species with its skull, which was obtained from the Zoological Society, and is the specimen described by Mr. Waterhouse in his Natural History of the Mammalia, i. p. 268. The other specimen there indicated as being in the British Museum is a young *C. maculatus*.

In Lesson's figure in Cent. Zool. t. 10, it is represented as uniform blackish-brown, with rather large white-edged ears!

The larger size of the teeth and the flatness of the forehead at once separate this from *C. maculatus*.

4. *CUSCUS ORIENTALIS*.

Ears produced beyond the fur, naked internally; forehead concave. Male white. Female pale reddish-brown, with a darker longitudinal streak; skull with a narrow concave forehead; grinders moderate.

♀ ♂ *Phalangista cavifrons*, Temm. Monog. i. 17.

♀ ♂ *Cuscus orientalis*, Gray, List Mamm. B.M. 84.

♀ ♂ *Phalangista* (*Cuscus*) *orientalis*, Waterh. Mamm. i. 279.

♂ *Coescoces*, Valentyn, Omst. in Amboyna, iii. 272.

Phalanger, Penn. Quadr. ii. 27.

♂ *Didelphis orientalis*, Pallas, Misc. Zool. 9; Schreb. Saugth. iii. 550. t. 152.

♂ *Cuscus Amboinensis*, Lacép.

♂ *Phalangista alba*, Geoff. Cat. Mus.

♂ *Cuscus albus*, Lesson & Garnot, Voy. Coq. Zool. i. 158. t. 6.

♂ *Balantia orientalis*, Illiger, Prodr. 78.

♀ *Phalangista rufa*, Geoff. Cat. Mus.; Desm. N. D. H. N. xxv. 473.

♀ *Phalanger*, female, Buffon, H. N. xiii. t. 10.

Cuscus Quoyii, Lesson, Mamm. 226.

Phalangista Quoyi, Quoy & Gaim. Voy. Uranie, Zool. 58. t. 6??; Temm. Mon. Mamm. i. 17.

Phalangista Papuensis, Desm. Mamm. Supp. ii. 541; Bull. Sci. Nat. iii. 64.

Phalangista (*Cuscus*) *maculata*, part., Waterhouse, Mamm. i. 275.

? *Cuscus albus*, Lesson, Voy. Coq. t. 6, ♂?

Of this species we have in the British Museum—

1. Adult male, from New Ireland, procured from M. Verreaux of Paris; said to have come from one of the expeditions. Pure white; throat yellow; feet nearly bald.

2. A nearly adult male, from the old collection, said to have come from Amboyna. White.

3. Young male? Uniform pale brownish-yellow; throat, chest and belly whiter. From the island of Waygeroo; procured from M. Verreaux of Paris.

4. Adult female. Ashy-brown, glistened with silvery; throat, chest and belly pure white; back with a narrow uniform longitudinal streak. This is sent as *Cuscus Quoyii*, Lesson, Mamm. 220; *Ph. Papuensis* of Desmarest, Supp. The figure of M. Gaimard's animal in the 'Voyage of the Uranie,' t. 6, is more like a variety of *C. ursinus*; but the description agrees with our animal.

5. Young female, from the island of Waygeroo; procured from M. Verreaux.

6. Young female, from Aru Islands; procured from Mr. A. R. Wallace. These two only differ from the adult specimen in the silvery hairs of the back being rather more abundant, but they seem to be deciduous.

Phalangista Papuensis of Desm. was described from a female specimen collected by M. Gaimard, which was afterwards described as *Ph. Quoyi*. In Quoy and Gaimard, 'Zoology to the Voyage of the Uranie,' it is described as having a darker dorsal line, which rather widens over the loins, which at once shows that it must be the female of *P. orientalis*.

Mr. Waterhouse has referred both these names without any comment as a synonym of *P. maculata*, misled probably by Temminck, who (Mon. Mamm. i. 18) states them to be the young of *P. maculata*—evidently overlooking the dorsal stripe.

Lesson, in the 'Voyage of the Coquille,' figures a male animal as *Cuscus albus*, t. 6, from Port Praslin, New Ireland; it is white, with a narrow black streak, just as in the female of this species.

Knowing the little authority that is often to be placed on M. Lesson's figures, I suspect it is the figure of a pale or perhaps bleached specimen of a female *P. orientalis*, in which some fold of the pouch, probably produced by bad stuffing, has been mistaken by the artist for the scrotum of a male.

5. CUSCUS CELEBENSIS.

Ears produced beyond the fur, naked internally. Male and female alike, ashy-grey, grizzled with silvery hairs; the nape and the upper part of the middle of the back blacker, but without any distinct dorsal streak.

Cuscus Celebensis, Brit. Mus.

Hab. Celebes.

We have of the species—

1. Young animal, from the island of Macassar; procured from Mr. A. R. Wallace in 1851.

2. Adult male and female, from San Cristoval, Soloman Group of Islands, Dec. 1855. Presented by John Macgillivray, Esq. and F. M. Rayner, Esq. in 1856.

GEOLOGICAL SOCIETY.

March 10, 1858.—Prof. Phillips, President, in the Chair.

“Notes on some Outline-drawings and Photographs of the Skull of *Zygomaturus trilobus*, Macleay, from Australia.” By Prof. Owen, F.R.S., F.G.S.

About a month since Prof. Owen received from Sir R. Murchison seven photographs, three of which are stereoscopic, of perhaps the most extraordinary Mammalian fossil yet discovered in Australia.

These photographs, with a brief printed notice of their subject by William Sharp Macleay, Esq., F.L.S., and some MS. notes by J. D. Macdonald, M.D., R.N., had been transmitted to Sir R. Murchison by His Excellency Governor Sir W. Denison, from Sydney, New South Wales; and by desire of Sir Roderick the Professor brought the subject under the notice of the Geological Society of London, to whom Sir Roderick desires to present the photographs on the part of His Excellency Sir W. Denison.

Professor Owen had some weeks previously received from George Bennett, Esq., F.L.S., of Sydney, outlines of the same fossil skull, made by him on the reception of the specimen by the authorities of the Australian Museum at that town; and the Professor had penned notes of his comparisons of these sketches before receiving the photographs and descriptions of the fossil skull from Sir R. I. Murchison.

This unique and extraordinary skull of a probably extinct Mammal, together with other bones, but without its lower jaw, were found at King's Creek, Darling Downs,—the same locality whence the entire skull and other remains of the *Diprotodon* have been obtained.

Mr. Macleay has described the fossil under notice as belonging to a marsupial animal, probably as large as an Ox, bearing a near approach to, but differing generically from, *Diprotodon*. He has named it *Zygomaturus trilobus*. The skull has transversely ridged molars, and a long process descending from the zygomatic arch, as in the *Megatherium* and *Diprotodon*, and exhibits an extraordinary width of the zygomatic arches. The skull at its broadest part, across the zygomata, is 15 inches wide, and is 18 inches long. In *Diprotodon* the skull is about 3 feet long by 1 foot 8 inches broad: so that while the latter must have had a face somewhat like that of the Kangaroo, the *Zygomaturus* more resembled the Wombat in the face and head.

Prof. Owen stated that, from the evidences afforded by the photographs, he finds the dentition of this upper jaw to consist of three incisors and five molars on each side, of which the first appears to be a premolar and the rest true molars, *i. e.*, $i. \frac{3-3}{}$, $c. \frac{0-0}{}$, $p. \frac{1-1}{}$, $m. \frac{4-4}{}$; agreeing, in this formula, with *Macropus* and *Diprotodon*. The mo-

difications of this dentition resemble those of the latter genus in the retention of the premolar, after the last true molar has come into its place, and in the superior size of the first, as compared with the second and third incisors. He then described in detail the sockets of the incisors, and the form and conditions of the molar teeth, which are highly characteristic of the marsupiality of this huge and most strange extinct quadruped. The cranial characters, which were next described, equally elucidate this affinity. The peculiar facial bones were then described in detail; that portion in advance of the orbits forming, as it were, a short pedunculate appendage to the rest of the skull, increasing in a remarkable manner in both vertical and lateral extent as it approaches the muzzle, but not offering any evidence of having borne a nasal horn, as thought to be probable by Mr. Macleay. The cavity of the nose is divided by a bony septum,—a character which Prof. Owen has lately found to exist also in a rare species of living Wombat—to a much greater extent than in other known marsupials. Wholly concurring in Mr. Macleay's conclusions as to the marsupial nature of the fossil in question, Prof. Owen does not think that it exhibits evidences of a generic distinction from *Diprotodon*. The Professor suggested, however, that probably the lower jaw, when found, may show some peculiarities of dentition and proportions similar to those on which he has founded the genus *Nototherium*.

ROYAL INSTITUTION OF GREAT BRITAIN.

March 12, 1858.—The Duke of Northumberland, K.G., F.R.S.,
President, in the Chair.

On the Lowest (Rhizopod) Type of Animal Life, considered in its relations to Physiology, Zoology, and Geology. By WILLIAM B. CARPENTER, M.D., F.R.S.

Among the unexpected revelations which the modern improved microscope has made to the scientific investigator, there is perhaps none more fertile in interest than that which relates to the very lowest type of animal existence; from the study of which both the Physiologist and the Zoologist may draw the most instructive lessons, whilst the Geologist finds in it the key to the existence of various stratified deposits of no mean importance both in extent and thickness.

Though the doctrines of Prof. Ehrenberg, as to the complexity of organization possessed by the minutest forms of Animalcules, have now been rejected by the concurrent voice of the most competent observers, working with the best instruments, yet the wonders of animalcular life are not in the least diminished by this repudiation of them. Indeed, as great and small are merely relative terms, it may be questioned whether the marvel of a complex structure comprised within the narrowest space we can conceive, is really so great as that of finding those operations of life which we are accustomed to see carried on by an elaborate apparatus, performed without any

instruments whatever ;—a little particle of apparently homogeneous jelly changing itself into a greater variety of forms than the fabled Proteus, laying hold of its food without members, swallowing it without a mouth, digesting it without a stomach, appropriating its nutritious material without absorbent vessels or a circulating system, moving from place to place without muscles, feeling (if it has any power to do so) without nerves, multiplying itself without eggs, and not only this, but in many instances forming shelly coverings of a symmetry and completeness not surpassed by those of any testaceous animals.

As an example of this type of existence, the *Amœba*, a common inhabitant of fresh waters, may be first selected. This may be described as a minute mass of “sarcodæ,” presenting scarcely any evidence of organization even of the simplest kind ; for although its superficial layer has a somewhat firmer consistency than the semifluid interior, this differentiation does not proceed to the extent of constituting even a body so simple as the “cell” of physiologists, which consists of a definite membrane investing and limiting its contents. Although at some times shapeless and inert, the *Amœba* at others is a creature of no inconsiderable activity. Its gelatinous body extends itself into one or more finger-like prolongations ; the interior substance transfers itself into one or other of these, distending it until the entire mass is (as it were) carried into it ; and then, after a short time, another prolongation is put forth, either in the same or in some different direction, and the body being again absorbed into it, the place of the animal is again changed. When the creature, in the course of its progress, meets with a particle capable of affording it nutriment, its gelatinous body spreads itself over or around this, so as to envelope it completely ; and the particle (sometimes animal, sometimes vegetable) thus taken into this extemporized stomach, undergoes a sort of digestion there, the nutrient material being extracted, and any indigestible part making its way to the surface, and being finally (as it were) squeezed out. The *Amœba* multiplies itself by self-division ; and portions separated from the jelly-like mass, either by cutting or tearing, can develop themselves into independent beings.

Nearly allied to this is another curious organism, on which the attention of many eminent microscopists has been recently fixed. This creature, the *Actinophrys*, has a body whose form is more constantly spherical, but extends its sarcodæ into radiating filaments of extreme delicacy, which are termed *pseudopodia* ; and it is by the agency of these, rather than by the change of place of its whole body (as in *Amœba*), that it obtains its food. For when any small free-moving animalcule or active spore of a vegetable comes into contact with one of the pseudopodia, this usually retains it by adhesion, and forthwith begins to retract itself ; as it shortens, the surrounding filaments also apply themselves to the captive particle, bending their points together so as gradually to enclose it, and themselves retracting until the prey is brought close to the surface of the body. The threads of “sarcodæ” of which the pseudopodia

are composed, not being invested (any more than the sarcode of the body) by any limiting membrane, coalesce with each other and with it; and thus the particle which has been entrapped becomes actually imbedded in the gelatinous mass, and gradually passes towards the central part of it, where its digestible portion undergoes solution, the superficial part of the body with its pseudopodial prolongations in the meantime recovering its previous condition. Any indigestible portion, as the shell of an Entomostracan, or the hard case of a Rotifer, finds its way to the surface of the body, and is extruded from it by a process exactly the converse of that by which it was drawn in.

If, now, it be asked, in what consists the peculiar animality of beings thus destitute of every feature that we are accustomed to associate with the idea of an animal,—that is, if it be inquired what are the characters by which they are distinguished from vegetable organisms of equal simplicity,—the physiologist cannot with confidence reply that sufficient evidence is afforded by the movements of the *Amœba* and *Actinophrys*; since among the lowest Plants there are many, which, at least in certain stages of their lives, are endowed with yet even greater activity. A more positive and satisfactory distinction lies in the nature of their aliment, and in the method of its introduction. For whilst the *protophyte* obtains the materials of its nutrition from the air and moisture that surround it, and possesses the power of detaching oxygen, hydrogen, carbon and nitrogen from their previous binary compounds, and of uniting them into ternary and quaternary organic compounds (chlorophyll, starch, albumen, &c.), the simplest *protozoon*, in common with the highest members of the animal kingdom, seems utterly destitute of any such power, and depends for its support upon organic substances previously elaborated by other living beings. Further, whilst the *protophyte* obtains its nutriment by simple imbibition, the *protozoon*, though destitute of any proper stomach, extemporizes, as it were, a stomach for itself in the substance of its body, into which it ingests the solid particles that constitute its food, and within which it subjects them to a regular process of digestion. Hence these simplest members of the two kingdoms, which can scarcely be distinguished from each other by any *structural* characters, seem to be *physiologically* separable by the mode in which they perform those actions wherein their life most essentially consists.

There are found, both in fresh and salt waters, numerous examples of this Rhizopod type, which do not present any essential advance upon the *Amœba* and *Actinophrys*; and a large proportion of these are endowed with a shelly investment which may be either calcareous or siliceous,—the former being the characteristic of the *Foraminifera*, the latter of the *Polycystina*. In some of these testaceous forms, the pseudopodia are put forth only from the mouth of the shell, whilst in other cases this is perforated with minute apertures for their passage; but where there are no such apertures, the sarcode body not unfrequently extends itself over the entire external surface of the shell, and may give off pseudopodia in every direction.

Generally speaking, the Foraminifera live attached to sea-weeds, zoophytes, &c.; but their pseudopodia have a very extensive range, and form a sort of animated spider's-web, most wonderfully adapted for the prehension of food. The absence of any membranous investment to these threads is clearly indicated by their fusion or coalescence when two or more happen to come into contact; and sometimes a fresh expansion of sarcode takes place at spots remote from the body, so as to form new centres from which a fresh radiation of pseudopodia proceeds.

By far the greater number of Foraminifera are *composite* fabrics, evolved, like zoophytes, by a process of continuous gemmation, each *gemma* or bud remaining in connexion with that from which it was put forth; and according to the plan on which this gemmation takes place, will be the configuration of the composite body thereby produced. Where the segments succeed each other in a line, that line is very commonly bent into a spiral; and each new segment being a little larger than the preceding, the spire gradually opens out, so that the shell very closely resembles that of the Nautilus, both in its form and in its chambered structure. There is, however, this essential difference,—that whereas in the Nautilus and other chambered cells formed by cephalopod mollusks, the animal lives only in the outermost chamber, all the inner ones having been successively vacated by it, each chamber in the foraminiferous shell continues to be occupied by a segment of the composite body, communicating with the segments within and without by threads of sarcode, which traverse minute passages left in the partitions between the chambers. In the classification of these forms, an extraordinary amount of allowance has to be made for the very wide range of variation that may present itself within the limits of one and the same specific type. It is very easy to select from any extensive collection of Foraminifera, recent or fossil, sets of forms having certain characters in common, but yet so dissimilar in other respects that few naturalists would have any doubt as to their specific or even generic distinctness; yet when the collection is thoroughly examined, such a series of intermediate forms is found to exist, as connects all these by gradations so insensible as to prevent the possibility of any line of demarcation being satisfactorily drawn between them. A remarkable example of this kind is presented by the generic types designated as *Dendritina* and *Peneroplis*; the former being a minute shell, resembling that of the Nautilus in its general proportions, and having a single large dendritic aperture in its successive partitions; whilst the latter is flattened, and instead of one large aperture, has a series of small foramina arranged in a single line. Now between these every gradation can be found, both in the form of the shell and in the mode of communication through the septa; the flattened shell of *Peneroplis* presenting various degrees of turgidity until it attains the proportions of *Dendritina*; and the linear arrangement of the isolated apertures, in like manner, giving place to one in which they are approximated more closely together into a sort of bundle, still, however, retaining their distinctness; whilst in other individuals,

the distinct apertures coalesce into one large jagged orifice, the borders of which become more and more deeply cut, until they present the ramifying extensions characteristic of *Dendritina*. Now, if, in such a series, we once begin to make a distinct species for every well-marked dissimilarity, either in the form of the shell, or in that of the aperture, we must multiply our species almost indefinitely, contrary to all probability; and there is no medium between doing this, and uniting the whole series of forms included in these two reputed genera under one specific type. This is the more remarkable, because in one locality we may find only the *Dendritina*-form, in another only the *Peneroplis*-form, whilst the transitional or intermediate forms come from a third.

Another remarkable example of this wide range of specific characters is presented in the *Orbitolite*, a composite organism, which, originating in a spheroidal nucleus of sarcode, increases by the formation of new segments in concentric rings around this, so that, each segment becoming invested with a shelly envelope, a very beautiful disk is formed, which is enlarged by successive additions to its margin. The segments communicate with each other by annular canals; and there are also passages connecting each annulus with those within and without; whilst from the outermost annulus there are passages opening at the margin of the shelly disk, through which alone the pseudopodia issue that obtain the food for the whole organism. Now there are two very distinct types of growth presented by these *Orbitolites*: one, namely, in which the disk is very thin, and the segments form (as it were) but a single floor; and the other in which the disk becomes comparatively thick through the vertical elongation of the segments, which, moreover, are themselves partially divided into at least three distinct stories; two, namely, which form the two surfaces of the disk, and an intermediate one, which is very distinctly separated from them both. The former type of growth may be designated as the *simple*, the latter as the *complex*. Now some *Orbitolites* seem to go through their whole lives upon the simple plan, whilst in others the complex plan shows itself in the very first ring; and from the comparison of such alone, it might be fairly supposed that these two plans are characteristic of two distinct species. But when a considerable number of these forms are examined, it appears that the simple type may pass into the complex at any period of its growth; the same disk presenting the simple plan in the first 5, 10, 20, 30, or more annuli, and the complex in all those subsequently formed. Hence there can be no question that even so marked a diversity in plan of growth is not in that case sufficient to establish a diversity of specific type, but that the two must be accounted varieties only.

A no less remarkable range of variation has been shown by Professor Williamson and Mr. W. K. Parker to prevail in other groups of Foraminifera which they have particularly studied; so that it would appear as if this type of animal existence were specially characterized by its tendency to such variations. And this will seem the more probable, when it is considered how little of

definiteness there is in the form and structure of the sarcode body that forms the shell; so that the wonder is, not that there should be a wide range of variation both in the form and in the plan of growth of the aggregate body, and in the mode of communication of the individual segments, but that there should be any regularity or constancy whatever. But it is only in the *degree* of this range that this group differs from others; and the main principle which must be taken as the basis of its systematic arrangement,—that of ascertaining the range of specific variation by an extensive comparison of individual forms,—is one which finds its application in every department of natural history, and is now recognized and acted on by all the most eminent zoologists and botanists. There are still too many, however, who are far too ready to establish new species upon variations of the most trivial character, without taking the pains to establish the value of these differences by ascertaining their constancy through an extensive series of individuals,—thus, as was well said by the late Prince of Canino, “describing specimens instead of species,” and burdening science not only with a useless nomenclature, but with a mass of false assertions. It should be borne in mind that every one who thus makes a bad species, is really doing a serious detriment to science; whilst every one who proves the identity of species previously accounted distinct, is contributing towards its simplification, and is therefore one of its truest benefactors.

Some of the most interesting physiological and zoological considerations which connect themselves with the study of this group having thus been noticed, its geological importance has in the last place to be alluded to. Traces, more or less abundant, of the existence of Foraminifera are to be found in calcareous rocks of nearly all geological periods; but it is towards the end of the Secondary, and at the beginning of the Tertiary period, that the development of this group seems to have attained its maximum. Although there can be no reasonable doubt that the formation of Chalk is partly due to the disintegration of corals and larger shells, yet it cannot be questioned that in many localities a very large proportion of its mass has been formed by the slow accumulation of foraminiferous shells, sometimes preserved entire, sometimes fragmentary, and sometimes almost entirely disintegrated. The most extraordinary manifestation of this type of life, however, presents itself in the “nummulitic limestone,” which may be traced from the region of the Pyrenees, through that of the Alps and Apennines, into Asia Minor, and again through Northern Africa and Egypt, into Arabia, Persia, and Northern India, and thence (it is believed) through Thibet and China, to the Pacific, covering very extensive areas, and attaining a thickness in some places of many thousand feet: another extensive tract of this nummulitic limestone is found in the United States. A similar formation, of less extent, but of great importance, occurs in the Paris basin; and it is not a little remarkable that the fine-grained and easily-worked limestone, which affords such an excellent material for the decorated buildings of the French metropolis, is entirely formed

of an accumulation of minute foraminiferous shells. Even in the nummulitic limestone, the matrix in which the Nummulites are imbedded is itself composed of minute Foraminifera, and of the comminuted fragments of larger ones. The remarkable discovery has been recently made by Prof. Ehrenberg, that the green and ferruginous sands which present themselves in various stratified deposits, from the Silurian to the Tertiary epoch, but which are especially abundant in the Cretaceous period, are chiefly composed of *casts* of the interior of minute shells of Foraminifera and Mollusca, the shells themselves having entirely disappeared. The material of these casts, which is chiefly siliceous, coloured by silicate of iron, has not merely filled the chambers and their communicating passages, but has also penetrated, even to its minutest ramifications, that system of interseptal canals, whose existence, first discovered by Dr. Carpenter in Nummulites, has been detected also in many recent Foraminifera allied to these in general plan of structure. And it is a very interesting pendant to this discovery, that a like process has been shown by Prof. Bailey to be at present going on over various parts of the sea-bottom of the Gulf of Mexico and the Gulf Stream; casts of Foraminifera in green sand being brought up in soundings with living specimens of the same types.

MISCELLANEOUS.

OBITUARY NOTICE.—ROBERT BROWN, Esq.

DIED at his residence, 17 Dean Street, Soho Square, formerly the library of Sir Joseph Banks, on the 10th of June, Robert Brown, Esq., D.C.L., F.R.S., Keeper of the Botanical Collections in the British Museum, and formerly President of the Linnæan Society. We translate from the '*Archives de Botanique*' for April 1833, the following notice of this great botanist, from the pen of M. Adrien de Jussieu:—

"The Academy of Sciences of the Institute of France reckons among its members eight foreign associates. Whenever death effaces one of these eight names, the name which appears most illustrious in the world of science out of France is designated to replace it. To read over the list of the foreign associates of the Academy from its foundation, is consequently to pass in review all those men whose memory is connected with the history of the great advances of the human mind,—Newton, Leibnitz, Euler, Linnæus, Haller, Volta, &c. The science which we cultivate may therefore be proud of the fact that, at this moment, of the eight elected from among the luminaries of science, two are botanists, M. DeCandolle and Mr. Brown.

"It was in the sitting of the 4th of March that Mr. Brown was elected by the Academy. Of 47 votes he obtained 29; the remainder were shared among his competitors, none of whom had more than 7 votes. They were Bessel, Von Buch, Faraday, Herschel, Jacobi, Meckel, Mitscherlich, CErsted, and Plana. That among so

many brilliant works due to these illustrious authors, those of Mr. Brown should have particularly fixed the attention and commanded the majority of the Academy, will not astonish our readers, accustomed as they are for the most part to the study of his works. It will be sufficient for us to recall them briefly, insisting upon results without paying attention to titles; for Mr. Brown's memoirs generally perform a great deal more than they promise, and it is almost always a specialty that he takes as a starting-point to ascend from it to the most comprehensive generalizations, by an artifice perhaps analogous to that which is recommended by the precepts of the poetic art.

"Mr. Brown early abandoned the practice of medicine for botany, towards which he was attracted by a peculiar taste and aptitude. He accompanied Capt. Flinders to Australia, and on his return to Europe occupied himself with the publication of the Flora of New Holland. The first volume of the 'Prodromus' of this Flora, unhappily the only one that has appeared, revealed to the scientific world a great botanist, whom France was the most prompt in recognizing. It is true that the author was the first, out of our own country, to step out of the narrow circle in which the followers of the Linnæan system had shut themselves up, and to employ the more capacious method which had its origin in France. But his merit was not confined to recognizing its superiority; he treated it like a master; and the creator of the Natural Method had the satisfaction of knowing that he was thoroughly comprehended, by the modifications which his system underwent in its adoption.

"Unquestionably, for a skilful botanist, no study could be better fitted to exercise and to demonstrate his sagacity than that of the plants of New Holland,—plants so different in external form from those of the other great continents, although the greater number of them are allied by the more important characters of their organization,—plants which appear to us, to use the expression of an ingenious botanist, as it were under a mask. In a series of important memoirs treating of these vegetables, and of those of Africa, of various natural groups, Mr. Brown has continued to furnish us with a multitude of new ideas on families, their limits, their relation to each other, and their composition. And while he throws light on a multitude of special points, he treats incidentally, or even in a note, on general questions of the highest order, as, for example, on the inflorescence (Memoir on *Compositæ*), on the identity of vegetable organs (Memoir on *Rafflesia*), on the questions which interest botanical geography (various Memoirs); or he takes pleasure in showing the value of characters previously neglected, such as those of præfloration (Prodr. Fl. Nov. Holl.), or of the stomata (Proteaceæ Nov. Holl.).

"Of late years, the question of the generation of plants appears to have fixed Mr. Brown's attention, and there have resulted several memoirs, short, indeed, but full of observation (*Kingia*—*Orchid.* and *Asclepiad.*), in which he makes known the double element of the problem, the organization of the ovule on the one hand, and of the

pollen on the other; and we may hope soon to see the mystery of this function cleared up by the valuable labours of authors of other nations, and particularly of our own, developing and extending those which he has published.

"To recall the principal claims of Mr. Brown to the admiration of botanists as a classifier, a describer, an anatomist, and a physiologist, is to enumerate those qualifications which obtained for him the suffrage of the Academy. Let us congratulate ourselves on having found this fortunate opportunity of placing his *éloge* before our readers; that of other botanists is commonly only the expression of our regret, and we occupy ourselves with their lives only when they have ceased to exist. Since we have now the good fortune to speak of a life still full of faculties and of activity, let us close by expressing a hope that it may continue to bear fruits and to multiply them, and by reminding Mr. Brown himself that several of his labours still wait for their completion, which ought not to be left to other hands than his own."

On the Anatomy of Terebratula australis. By P. GRATIOLET.

M. Gratiolet's memoir, although published two months after that of Mr. Hancock on the organization of the Brachiopoda, was prepared long before the publication of the latter. Without entering into a detailed analysis of M. Gratiolet's work, we may remark, that the sketch of the circulation of the blood given by him does not at all agree with that furnished by Mr. Hancock. M. Gratiolet considers as the centres of the circulation the two organs which, since the investigations of Cuvier upon *Lingula anatina*, have by common consent been denominated *hearts*. According to Mr. Hancock, on the contrary, these organs have nothing to do with the circulation, but serve probably for the emission of the eggs, the true heart being a single organ. • It is clear that so fundamental a difference cannot be reconciled in any way; but it is as well to remark, that M. Gratiolet has only had *Terebratulæ* preserved in spirit at his disposal.

Mr. Hancock denies the existence of the anus in the Brachiopoda, in opposition to Prof. Owen, who admits the presence of an anal orifice. It is consequently interesting to find that M. Gratiolet has been unable to discover the anus of *Terebratula australis*. However, he is more cautious than Mr. Hancock, and does not deny its existence because he has not seen it; far from this, he regards its existence as probable, but asserts that it must be very small.

M. Gratiolet has also closely investigated the mechanism of the muscles of the shell and peduncle of *Terebratula australis*. In common with Woodward, Davidson and Hancock, he has recognized the system of muscles which serve to open the shell; these he denominates *diductor muscles*; they are the *cardinal muscles* of the two former writers, and the *divaricators* of Hancock.—*Journal de Conchyliologie*, Oct. 1857, and *Bibl. Univ.* June 20, 1858, p. 176.

On the Torpidity of the Marmot. By G. VALENTIN.

The object of this memoir of M. Valentin is to examine the influence of the winter-sleep upon the production of glucose by the liver. During an abstinence from food of five or six months, the sugar is persistent in the liver of the Marmot; from this it follows that there is an essential difference between the true winter-sleep of the Marmot and the torpidity of the Batrachia, or the state of inanition of waking animals.

When, as is sometimes the case, the death of the animal is caused by exhaustion at the end of the winter-sleep, the liver no longer contains sugar. The same fact is observed in Hedgehogs which have died during their winter-sleep. On the contrary, when a healthy Marmot, killed at the end of its torpidity, is examined, it is found that the fresh blood of the aorta and the fresh urine will precipitate small quantities of protoxide of copper, showing that they contain glucose.

Some authors have expressed the opinion that the liquid secreted by the stomach is absorbed, and that after passing through the vena porta, it produces sugar in the liver. M. Valentin opposes this view, and cites several facts which speak against it.

The author has observed a striking difference between the sugar of the liver of Marmots in their winter-sleep and that of other waking animals; the former is not so readily destroyed by putrefaction as the latter.

In conclusion he cites an observation made upon some frogs which had passed four months of the winter in a dark cellar. They were frozen by exposure to a temperature of $+5^{\circ}$ F.; the sugar of their livers did not disappear.—*Moleschott's Untersuchungen*, vol. iii.

Description of Aphroceras, a new genus of Calcareous Spongiadæ brought from Hong-Kong by Dr. Harland. By Dr. J. E. GRAY, F.R.S. &c.

APHROCERAS.

Sponge tubular, branched, without any large superficial oscules, formed of two distinct coats, externally covered with simple fusiform calcareous spicula, placed side by side in the longitudinal axis of the stem and branches, forming an even coat; inner surface of the tube lined with a minute network of interlaced fibre placed in all directions; branches simple, tapering, attenuated at the tip, with a round terminal contracted aperture.

The spicula are entirely dissolved in dilute muriatic acid, leaving the form of the sponge marked by the internal network and the sheaths of the spicula on the surface. When treated with caustic potash, the internal network is destroyed, leaving only the external spicula placed side by side.

This genus is allied to *Grantia*, but it is easily distinguished by the uniform fusiform shape and the disposition of the spicula.

APHROCERAS ALCICORNIS.

Hab. Hong-Kong (Dr. Harland).

This species somewhat resembles *Grantia botryoides* in appearance and habit; but in that species the spicula are all *triradiate*, which appears to be the generic character of the genus *Grantia* as I propose to restrict it.—*Proc. Zool. Soc.* Feb. 23, 1858.

On the Hypermetamorphosis and Habits of Sitaris. By M. FABRE.

M. Fabre has been engaged in the investigation of the habits and metamorphosis of *Sitaris*, a genus of Coleopterous insects nearly allied to *Meloë*; the latter, as is well known, was the subject of some of the admirable investigations of the late George Newport. Singularly enough, M. Fabre was quite ignorant of the memoir of the great English physiologist, up to the time of his reading his own paper before the Academy of Sciences. The principal facts in the latter are summed up by the author in the following words:—

“The species of *Sitaris* and *Meloë*, and apparently other *Meloïdes*, if not all, are, in their early stages, parasitic on Anthophilous Hymenoptera.

“The larva of the *Meloïdes*, before arriving at the pupa state, passes through four forms, which the author denominates *primitive larva*, *second larva*, *pseudo-chrysalis*, and *third larva*. The passage from one of these forms to the other is effected by a simple change of skin, without any alteration in the viscera.

“The *primitive larva* is coriaceous, and takes up its abode on the bodies of Hymenopterous insects. Its object is to get transported into a cell full of honey. When it reaches the cell, it devours the egg of the Bee, and its part is performed. This is the active hexapod larva, described by Newport and other observers as the first product of the egg in *Meloë*.

“The *second larva* is soft, and differs entirely from the primitive larva in its external characters. It feeds upon the honey contained in the usurped cell.

“The *pseudo-chrysalis* is a body destitute of all movement, and clothed with corneous integuments comparable to those of pupæ. On these integuments there are the design of a cephalic mask, without moveable and distinct parts, six tubercles indicating the feet, and nine pairs of stigmatic orifices. In *Sitaris* the pseudo-chrysalis is enclosed in a sort of sac formed by the skin of the second larva. In *Meloë* it is simply half invaginated in the cleft skin of the second larva.

“The *third larva* exhibits nearly the same characters as the second. In *Sitaris* it is enclosed in a double vesicular envelope formed by the skin of the second larva and that of the pseudo-chrysalis. In *Meloë* it is half-enclosed in the cleft skin of the pseudo-chrysalis, which, in its turn, is inserted in the same way into that of the second larva.

“After this, the metamorphosis follows the usual course; the third larva becomes a pupa, and the latter a perfect insect.”—*Comptes Rendus*, March 1, 1858, p. 443.

THE ANNALS

AND

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[THIRD SERIES.]

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VIII.—*On the Structure and Position of the genus Teredina of Lamarck.* By Dr. J. E. GRAY, F.R.S., V.P.Z.S., Pres. Ent. Soc. &c.

LAMARCK, in the ‘*Histoire Naturelle des Animaux sans Vertèbres*,’ published a genus under the name of *Teredina* for a Miocene fossil shell which he had before referred to *Fistulana**, a genus which he, in the work above referred to, further separated into several others, *Teredina* among the rest.

Lamarck formed the genus *Teredina*, with *Aspergillum*, *Clavagella*, *Fistulana*, *Septaria*, and *Teredo*, into a family, which he called “*les Tubicoles*,” because they live in tubes, and separated them for this reason from “*les Pholadaires*.”

The genus is thus defined by its author, who was evidently forming a character to separate it from *Aspergillum*, *Clavagella*, and *Teredo* :—“Fourreau testacé tubuleux, cylindrique ; à l’extrémité postérieure fermée, montrant les deux valves de la coquille, à l’extrémité antérieure ouverte” (vol. v. p. 438).

M. de Blainville, in his ‘*Manuel*,’ united the two families of Lamarck into one, under the name of *Adesmaceæ*, and arranges the genus *Teredina* between *Teredo* and *Pholas* ; he gives the following improved generic character, derived from a very perfect specimen in the collection of M. Deshayes :—

“Coquille épaisse, ovale, courte, très baillante en arrière, équivalve, inéquilatérale ; les sommets bien prononcés, un cuilleron épais sur chaque valve. Une pièce medio-dorsale, ovale, en bouchier, sur les sommets de la coquille, et se prolongeant en

* The genus *Fistulana*, as first established in Ann. Mus. vii. 425, was divided, in the work above referred to, into several genera, and, as characterized in his later work above quoted, is a *Teredo*, which has been formed into a genus named *Xylotrya* by Leach.

arrière en un tube complet à orifice terminal unique?" (Man. Malacol. p. 579, 1825.)

The existence of the dorsal buckler or plate at once shows the affinity of these fossils to *Pholas*.

James Sowerby the elder figured the shell in his 'Mineral Conchology,' and referred it to the genus *Teredo*, under the name of *Teredo antenautica*, overlooking the character afforded by the dorsal plate, which is always absent in *Teredo*, and the absence of *palettes*, or terminal opercular valves, as they have been called, and a containing shelly tube, which are always present in that genus.

M. Deshayes, in his 'Coquilles fossiles de Paris,' retains the two families, *les Tubicoles* and *les Pholadaires*; of Lamarck, and gives nearly the same character for the genus as that quoted from De Blainville's work; only he calls the *cuilleron* of De Blainville *palettes*; but this is evidently a slip of the pen, as the part described is always called a *cuilleron* by French authors, in the genera *Pholas* and *Teredo*, which alone, with *Teredina*, possess the process under the umbo so referred to. He adds,—“Ce genre fait évidemment le passage aux Taret” (*Teredo*) (vol. i. p. 18).

Deshayes, more lately, in his notes to the new edition of Lamarck, observes, “Le genre curieux des *Térédines* n'a pas été bien connu de Lamarck; sans cela il lui aurait donné des caractères plus complets. La *Térédine* est une véritable *Pholade* globuleuse fixée à l'extrémité d'un tube” (vol. vi. p. 34).

Mr. Woodward, in his 'Manual,' which is specially devoted to the determination of fossil shells, overlooking these observations, and perhaps misled by the position of the shell in the old work of James Sowerby the elder, regards *Teredina* as a subgenus of *Teredo*! He further observes, “Valves with an accessory plate in front of the umbo, free when young, united by the margins of the shelly tube when adult (?). The tube is sometimes concamerated, its siphonal end is often truncated, and the opening contracted by a lining, which makes it hour-glass shaped or six-lobed (fig. 25 a).” ('Manual,' p. 330.)

The fossil *Teredina* has been considered as a *Teredo* by James Sowerby, a *Fistulana* by Lamarck, as a subgenus of *Teredo* by Woodward, and as a genus intermediate between *Teredo* and *Pholas* by Deshayes, but who still arranges it in a distinct family from the latter; and latterly, M. Deshayes has considered it as a species of the genus *Pholas*; and in my genera of the family *Pholadidae* I placed it as a genus of that family.

A careful examination of the structure of the shell and its tube, as it has been called, show that it is, as M. Deshayes observes, a true *Pholas*. Indeed, it ought to have been referred

to that genus by the Lamarckian conchologist, as soon as the dorsal valves were discovered, and the genus *Teredina* erased from the list, as it has all the characters of *Pholas* as defined by Lamarck.

This is an instance of the careless manner in which a single species is elevated by some authors of that school into the rank of a genus, because its structure has been misunderstood or because it possesses some slight peculiarity of external appearance, while at the same time they retain, in other genera, a number of species possessing forms which offer quite as important characters to distinguish them.

It only resembles *Teredo* in the shape of its valves, but is immediately distinguished from it by the absence of the shelly case of the cavity in the marine body in which it resides, in the absence of any palettes (or opercula, as they are sometimes called) at the sides of the ends of the siphons, and in the presence of the dorsal plate over the umbo, which is never present in this genus. It has no affinity to such genera as *Aspergillum*, *Clavagella*, or *Gastrochaena*, to which Lamarck, G. B. Sowerby*, and many authors compared it, as it does not live in a tube, the part which they described as a tube being only the sheath of the siphons lapidified by the process of fossilization, as is proved not only by its position as regards the valves, but also by its bulging form, which shows that it was formerly soft and yielding.

Mr. G. B. Sowerby, in his 'Genera of Mollusca,' says this genus "has an operculum, as we are informed, though we have never seen it, which covers the double opening;" and, further, he says it differs from *Pholas papyracea* in "having an operculum to cover the posterior aperture of the tube." I have searched for these opercula or *palettes* in a large series of specimens without discovering the slightest trace of them; indeed, the siphons are not formed as if they were present; and the absence of the tube covering the entire animal, siphon, and valves, with which they are always combined, renders their presence not to be expected.

Mr. G. B. Sowerby describes them as "gregarious, occurring in numbers in a bed of ferruginous sand," "living in cavities of its own terebrating." He further observes, "That in its young state it is destitute of a tube, and consists only of two valves and a membranaceous envelope, we cannot doubt." I do not believe that there is any difference between the old and young in this respect, as in both states I think it is evident the tube

* Mr. G. B. Sowerby observes that "the tube in *Teredina* never covers the two valves, but appears to be soldered to them, as in *Aspergillum*." (!) ('Genera.')

was soft and flexible when the animal was living. There is little doubt that in the young state the large rhombic gape between the front of the valves is open, as in *Teredo*, *Zirfæa*, and the young of *Martesia*, though I have never seen a specimen showing this state of the animal, but always with this part closed, as in the adult example of the latter and several other genera of *Pholadidæ*.

Among the recent genera of *Pholadina* it is most nearly allied to *Martesia*, but it differs from that genus in several important particulars, which may be thus stated:—

1. The valves are small, compared with the size of the siphons, and the gape is larger and more rhombic.

2. The siphons are much larger, compared with the valves and shell, and swollen beyond them; in the fossil state they are covered with a hard calcareous coat, or rather coats, for the part which is described as the tube is formed of several concentric calcareous layers. These siphons, though in the fossil state they are hard and shelly, have all the appearance of having been soft and flexible in the living animal, like the siphons of *Zirfæa crispata*, which they greatly resemble in appearance; for they are bent in various directions, and are swollen beyond the edge of the valves behind, so as to have all the bag-like appearance which the fleshy flexible siphons of these bivalves present.

The surface of the stony siphons of the best-preserved specimens of *Teredina* presents the minutely wrinkled surface which is to be observed on the more or less coriaceous coat, similar to the periostraca of the valves which envelope the fleshy siphons of *Pholades*, *Myæ*, and others which have large, constantly exposed siphons.

It is to be observed, that the shelly cast of the siphons of this genus generally presents two very different appearances: the lower portion nearest the valves is usually hollow, and formed of several thin, concentric, shelly laminæ, as is easily seen when it is broken across. The upper portion is only provided with a thin, easily deciduous, shelly coat, filled within with a brown solid nucleus, pierced in the centre with two more or less distinct tubes. This portion appears to represent the part of the two siphons which is united together; as it is easily separated from the lower portion, many specimens contained in collections are destitute of this part, and, from Lamarek and De Blainville's descriptions, I should suspect that it was wanting in the specimens they described. The two portions are well figured in Sowerby's 'Genera of Shells,' fig. 1, and the lower portion, showing the laminated appearance of this part, in fig. 3 of the same plate.

It is probable that the upper portion may have been mistaken

by some observers, as mentioned by Mr. G. B. Sowerby, for *opercula* or *palettes*.

3. The gape in the front of the valves is filled up, as is the case with the adult specimens of *Martesia*; but here it is filled up with a single shelly plate, leaving only a small perpendicular slit in the middle of the well-marked medial line, while in *Martesia* the plates filling up the gape in each valve are always separate. This plate, as in *Martesia*, is formed by the gradual addition of shelly matter to the front margin of the gape of the valves, until it reaches the middle, where the two plates are united into one, leaving the central slit. The development of this plate is shown by the concentric lines of growth which are to be observed on its surface in well-preserved specimens.

4. The hinder part of the cardinal and ventral margins of *Teredina* is destitute of any additional shelly plates, which are generally developed in the species of the genus *Martesia*.

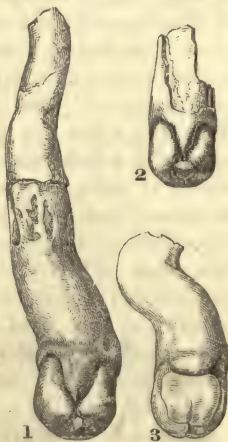
I think, after these comparisons, that we may conclude that *Teredina* is a genus of *Pholadina* allied to *Martesia*, but sufficiently distinct from it to be retained as a separate genus, as I suggested in my paper "on the Arrangement of *Pholadidae* into Natural Groups," Ann. & Mag. Nat. Hist. viii. 1851, p. 384.

I believe that at present only a single species of the genus is known, which varies much in size according to the position it holds in the colony, some obtaining more and others less nourishment, from local causes.

They present so much variety in the form and state of development of the additional dorsal valve or *bouclier*, that if they were not all collected together from the same colony on the same piece of rock, one might be induced to consider them as belonging to two or more distinct species.

In some specimens the dorsal shield is small, placed entirely in front of the umbo, looking like a flattened bag, narrow in front, rather wider and more convex behind, and slightly contracted on the sides (fig. 2). In this state it is figured by M. Deshayes (Coq. Fossiles de Paris, tab. 1. f. 24).

In others it is large, convex, subquadrangular, covering the umbo and the upper central part of the base of the siphon, which is prominent behind



Teredina personata.

Showing how the siphons bulge over the valves. 1. In usual state, without the dorsal plate; 2, with a small, 3, with a large or perfectly developed dorsal plate.

the hinder part of the cardinal edge of the valves (fig. 3); it is deeply notched in the middle of the front edge over the separation of the valves, and more or less sinuous on the middle of the side edges over the convexity of the valves, as it is figured by Sowerby ('Genera,' f. 2 & 4)*; but it is often of a much larger size compared with the size of the valves, and more sinuated in front and on the sides than it is here represented. In most specimens of these fossils the dorsal valve is wanting, and there is only a slight fracture between the front of the hinge-margin of the valves, showing the remains of the cast of the shell by which it was attached (fig. 1), as it is represented in fig. 3 of Sowerby's 'Genera.'

[A Postscript to this paper will be found on page 162.—ED.]

IX.—On the *Spermatology of a new species of Nais*.

By H. J. CARTER, Esq., H.C.S. Bombay.

[Concluded from page 33.]

Development of Spermatozoa in the Ovisac.

IN the ovisac, *pari passu* with the ovum, the spermatozoa also frequently become developed; and this takes place in the following way: viz. a number of cells identical to all appearance with the floating-cells of the peritoneal cavity, that is, consisting of a cell-wall enclosing a number of refractive vesicles supported on an albuminous sphere or centre, fill that part of the ovisac which is not occupied by the group of ova. These, at a very early stage, when only a few are present (Pl. II. fig. 3 *h*), may be seen loose and under a spherical or diffuent form (*i*), or in agglomerated masses of twos, threes or more (*k*), or attached to the surface of the ovisac, and caudate (*l*), thus evincing the same plasticity of cell-wall that we have observed in the cell-wall of the floating-cells when adhering together or to the parietes of the peritoneal cavity, while most of the cells present, respectively, a few granules of that light brown matter in their interior, to which I have already alluded as a distinguishing mark of the sperm-cell throughout. (For more magnified views of these figures, see Pl. III. fig. 13 *a—f*).

After a time the vesicles enlarge, through nourishment probably derived from the "branchial" vessels, and surround, either entirely, or partially in groups, globular masses of fine granular matter, which vary in size from that of the sperm-cell upwards (figs. 14, 15), most of which contain more or less of the

* In the explanation of the plate, this figure is erroneously said to represent the form of the aperture of the shell.

characteristic brown matter. It has already been stated that the vesicles are disposed (according to their number) partially in a group or entirely around the albuminous centre of the floating-cell of the peritoneal cavity; and it is well to bear this in mind, for we shall see presently that when the spermatozoa which are produced from them are half-developed, they hang generally or partially in groups from the globular agglomerations, and that this grouping may be thus accounted for (figs. 17, 18, &c.). At this period (fig. 9) the vesicles are filled with a homogeneous refractive substance, which, upon contraction, after having been some time exposed to the action of the water, shows that it is composed of a granular endoplasm, supporting in one part of its periphery a nucleus,—in fact, that each vesicle is a complete cell (fig. 26 *a, b*); while the material of which the granular mass is composed at this time is so fine, that it has hardly passed beyond the homogeneity of the original albuminous mass (fig. 26).

The next stage in the development of the spermatozoa is that the vesicles become elongated and conical, and that the pointed extremity is applied to the granular mass, whose granular matter is also now becoming progressively coarser (figs. 10 & 16).

During the fourth stage, the conical point becomes lengthened into a pedicel, which thus presents the first appearance of the spermatozoon, and the material of the granular mass has become still coarser (figs. 11 & 17).

During the fifth stage (figs. 12 & 19), the spermatozoon grows out to its full length, and disunites itself from the granular mass (fig. 12 *e*), which, although keeping together in the ovisac while the spermatozoa are coiled round it, no longer coheres as before when forced out into the water, but, being effete, becomes lost or dispersed as soon as this takes place.

The part by which the spermatozoon adheres to the granular mass, though not distinguishable here from its linear form, is seen to be the head in *Nais albida* (figs. 32 & 33): hence it is the head which would appear to be developed first; and so Kölliker has stated, but not however in the way thus indicated, for he has observed that the whole of the spermatozoon becomes developed first in a cell within the vesicle (fig. 21 *a*), from which it gets into the cavity of the latter, and then forces its head out of one part to become attached to the granular mass*; but in all instances where the half-developed spermatozoa of this *Nais* have had the contents of the vesicle at their extremities contracted from long exposure to the water or from the addition of iodine, they have presented a granular aspect. This, however, may be, and probably is, owing to the extremely fluid state of

* Art. "Semen," Cyclop. of Anat. and Physiology, p. 486.

the matter composing the spermatozoon at this early period; for in *Nais albida* always, and even in *N. fusca* sometimes, the tails also project from the opposite side of the vesicle at the same time (figs. 25, 31, 32), thus proving that the whole body of the spermatozoon, at least in these cases, is formed at this early period. I have, however, not been able to see this or the daughter-cell in the sperm-vesicles of either of these *Naides*; nor have I, of course, been able to see that the spermatozoon is formed in the nucleus, as also stated by Kölliker*,—that is, I suppose, in the nucleus of the daughter-cell of the vesicle†,—probably from the smallness or unsuitableness of the materials I have had to deal with.

Among the contents of the ovisac from which the spermatozoa are thus developed, there are some granular masses which are surrounded by vesicles much larger than others (fig. 26), and these vesicles, although filled apparently with homogeneous refractive matter, like the rest, show, by the contraction of this into a globular form after they have been some time exposed to the action of water, that it also consists of a granular mass of endoplasm bearing in one part a nucleus (*a, b*). How such large vesicles are to bring themselves down to the size of those which only bear one spermatozoon each (fig. 16 *a*), I have not been able to understand; and never having observed more than one spermatozoon developed respectively from the vesicles attached to the granular masses, and these vesicles all small ones, I am at a loss to conceive what happens to the large vesicles, unless they become still larger, and then develope several cells in their interior, each of which bears a spermatozoon, as the presence of such cells now and then in the ovisac of *N. fusca* would seem to indicate (figs. 29, 30). That several spermatozoa may be developed from one vesicle is a common occurrence, and fig. 37 is an instance of it in *Ampullaria*; but whether this is another instance of each spermatozoon being developed from a separate cell, or the whole mass of cell-contents has split up into the bundle of spermatozoa thus represented, I am not called upon, or prepared even, here to discuss. Views respecting this will be found in the admirable article on "Semen," to which I have alluded. I must confine myself here to the common and only course of development in *Nais fusca* that I have been able to follow with certainty; and that is the one above described, wherein not only a gradual development of the spermatophorous vesicles can be traced from their first presence in the sperm-cell to the time when they become conical and present the first appearance of the spermatozoon, but the presence of the

* Art. "Semen," *Cyclop. of Anat. and Physiology*, p. 497.

† Is this a "nucleus," or the embryo of the spermatozoon?

brown matter unmistakeably marks the spermatophorous mass throughout, from the sperm-cell to the full development of the spermatozoa.

Let us now see what evidence we possess of connexion between the single small sperm-cell and the large globular masses supporting the vesicles, from which the spermatozoa are developed in the ovisac. In the first place, the only cells which are present in the ovisac, before the process leading to the development of the spermatozoa commences, are the ova *en groupe* and the sperm-cells, which at this time are identical with the floating-cells (fig. 9 *a, c*). It cannot be the ova, then, which develop the spermatozoa; hence we have only the sperm-cells left. Next we find several of the sperm-cells cohering together through the plasticity of their cell-walls, and forming agglomerations of different sizes; hence the *large* globular masses are accounted for (figs. 3 *k* and 13 *d*); while the presence of some cells or masses not exceeding the diameter of the single sperm-cell, yet bearing spermatozoa, shows that cells or masses, from the size of the sperm-cells up to that of the largest agglomerations, may bear spermatozoa (fig. 27). Lastly, having seen that the number of vesicles in the sperm-cells is very variable, and that these entirely surround the albuminous centre when numerous (13 *a, b*), or, when scarce, are situated on one part of it in a group (fig. 5 *d*), while they may be also partially or entirely absent, we have thus, in the early stage of the single sperm-cell, that which we have afterwards in the agglomerated mass, viz. the vesicles covering the mass entirely, or only attached to one part of it (figs. 17 & 18). Besides, it is very common to see the agglomerated masses themselves, at an early period, presenting groups of vesicles here and there upon them, indicative that the cells forming these parts of the masses respectively, alone bear vesicles (fig. 13 *d*). One point more deserves notice here, and one, too, which has not been well accounted for by the authors of the excellent article to which I have alluded, viz. the disappearance of the cell-wall or mother-cell in the globular masses. But this yields immediately to explanation when we know the cell-wall of the sperm-cells to be plastic, and therefore easy of disappearance in several ways; indeed, it is so evanescent, that in many of the cells of the reproductive band, as well as of the hepatic layer, where the *vesicles* have not undergone the least enlargement, the cell-wall is almost as often absent as present. However, one instance has occurred to me where the cell-wall seemed to have remained; and this was where the spermatozoa, which were more than two-thirds developed, had grown out from single sperm-cells—judging from their size (fig. 27). Here, then, it would appear that the mother-cell had become persistent from harden-

ing, and that, as the vesicles under these circumstances could not be projected from the granular mass on the caudal ends of the spermatozoa as usual, the caudal ends had passed through both their vesicles respectively and the mother-cell. Fig. 28 also represents another instance where the mother-cell of an agglomerated mass appears to have remained. In some cases, too, even where the mother-cell is not persistent, and the vesicles, as usual, remain in contact with the granular mass, the tails of the spermatozoa are thrust through their opposite side (figs. 25 & 31-33), while not unfrequently both head and tail may be projecting while the vesicle is in the centre, as before mentioned (fig. 21 *b*). All this, however, is readily explained; for the vesicle in which the spermatozoon is developed is so flexible and plastic, that although the enclosed spermatozoon can throw it into all kinds of shapes, and half extrude itself, it is with the greatest difficulty only that it can throw it off altogether, while it is frequently so delicate in structure, and so diaphanous, that it is also very difficult to believe that it is not a part of the spermatozoon itself, whence the spermatozoon occasionally appears under a variety of shapes that are apt to mislead the observer in his determination of its true form.

Another point deserving of attention is the origin of the "brown matter," not only in the sperm-cells of the ovisac, but also in those of the so-called testes. This, as regards the former, seems easily determined; for if the sperm-cells of the ovisac be derived from the floating-cells of the peritoneal cavity, and the floating-cells subsequently become the hepatic cells, there is every reason to infer that the brown colouring matter is but the yellow colouring matter of the bile thus altered,—an inference which derives confirmation from the fact that the globular masses bearing spermatozoa in *Ampullaria* (figs. 35, 36) frequently bear at the same time one or two large bright bile-globules (*a*), together with the granules characteristic of the hepatic cell, some of which present the brown colour and character of the brown granules of the sperm-cell, and appear, as before stated, to be the abortive or effete remains of the bile-vesicles; so that here (figs. 35, 36) we have the granular mass with some of the vesicles half-developed into spermatozoa; others united together, forming bright amber-coloured bile-globules; and a third set in an abortive or effete state, presenting themselves under the form of granules, some of which have the colour and appearance of the brown granules of the sperm-cells. Thus we have not only evidence of the sperm-cells producing bile, like the hepatic cells, but also this fact corroborating the inference that both the sperm-cells and hepatic cells are derived from the floating-cells of the peritoneal cavity.

We have yet, however, to account for the presence of this colouring matter in the sperm-cells of the testes (fig. 6 *e*), which cells, as before stated, appear to be derived from the dermal cells of the reproductive band,—a point that should certainly not be considered as a natural consequence from their apparent identity with the floating-cells only; but it so happens that there is a maculated *Nais* which dwells in the salt- as well as the fresh-water pools here, and which latterly I have also found in the sediment of the jar of *Chara* before mentioned, where the dermal cells throughout bear amber-coloured globules (the *maculae*), corresponding in appearance to bile, and answering to the common chemical tests for oily matter, that is to say, dissolving under the influence of æther or a solution of caustic potash respectively. Thus we have the dermal cells in this species, at all events, secreting an oily matter like bile, if not identical with it: and the cells of the reproductive band being but dermal cells apparently modified by hypertrophy, and thus brought into a state similar to the floating-cells of the peritoneal cavity, which appear both to secrete the bile and form the spermatozoa, as the occasion may demand, we have this sort of explanation (should these cells of the testes be hereafter proved to come from the reproductive band) to account for their presenting the characteristic brown matter of the sperm-cell of the ovisac.

Thus I have stated all that has occurred to me in the development of the spermatozoa in the ovisac of *Nais fusca*, worthy of mention; and although I have not been able to follow the developmental process of the spermatozoa in the so-called testes of this worm throughout, yet the *lacunæ* have been supplied from the progressive development of the sperm-cells in the testes of *N. albida*, which, proving to be the same as that of the ovisac of *N. fusca*, thus completes the process for us in the testes of both. Still, where the sperm-cells of the testes in these two species of *Nais* come from in the first instance, remains undiscovered.

Let us now, before going to the development of the embryo, compare with one another the changes which take place in the development of the ovum and sperm-cell, in order that we may see how far they correspond.

Ovum.	Sperm-cell.
Composition.	
Cell-wall.	Cell-wall.
Endoplasm (primordial film or cell).	Endoplasm (primordial film or cell).
Yolk (composed of fine granules).	Albuminous sphere (composed of crypto-granular refractive matter).

*Ovum.**Sperm-cell.**Composition.*

Nucleus (or "germinal vesicle").	Nucleus.
Nuclei (or points in the endoplasm of the "germinal vesicle").	Vesicles (or cellules round the albuminous sphere).

Changes. 1st stage.

Cell-wall continues.	Cell-wall continues.
Endoplasm disappears.	Endoplasm disappears.
Yelk-granules become large and multiplied.	Albuminous sphere becomes perceptibly granular.
Nucleolus (or "germinal spot") perishes.	Nucleus perishes.
Nuclei, or points in the endoplasm of the "germinal vesicle," become surrounded by cells respectively.	Vesicles develop spermatozoa which attach themselves to the albuminous sphere.

2nd stage.

Nucleus or "germinal vesicle" disappears (that is, bursts, and the "nuclei," now surrounded by cells, are dispersed in the yelk ?)*.	Spermatozoa fully formed and separated from the albuminous spheres or granular masses.
Yelk persistent.	Granular masses effete.

3rd stage.

Ovum receives the spermatozoa.	Spermatozoa enter the ovum.
Yelk-granules are resolved into a crypto-granular mass.	
Yelk, having received its final envelopes and been laid, undergoes deduplicative subdivision.	

Thus we see that the differences between these processes are so great, that they cannot even be considered analogous. The new cells produced by the ovum and sperm-cell respectively, that is, the cells of the nucleus and the "vesicles," are the only products that we can compare with one another; and these are so far different, that one is produced in the germinal vesicle, and the other out of it, while the yelk of the ovum no doubt affords nourishment to the germinal vesicle, as does the granular mass

* I have also observed some of these cells (fig. 12 *h*) to be again charged with nuclei, indicative of their undergoing a further multiplication after having been dispersed in the yelk.

to the spermatozoa ; but with the complete development of the latter, the functions of the granular mass cease, at the time that those of the yelk chiefly commence. There is so little analogy, then, between these two processes, that while they are *sui generis* as regards each other, that producing the spermatozoa is, I think, different from any other processes of cell-formation with which I am acquainted. Of course I allude here to the attachment of the spermatozoa to the albuminous sphere, and not to those instances where the whole of the cell-contents of the spermatie or mother-cell become divided up at once into a group of spermato-phorous vesicles, each of which encloses from the beginning its share of nourishment, and thus has no occasion for re-attachment to an albuminous centre, as in some species of microscopic *Filariæ*. This is common enough among the Algæ.

Impregnation.

This I have not seen, and therefore there is a *hiatus* here which I cannot supply. Out of all the enlarged ova that have come under my observation, not one has presented that broken-down appearance of the granules of the yelk which follows impregnation ; and although many have been bordering upon this stage, yet it has been impossible to witness impregnation by keeping the individual under the microscope, for the very pressure of the slip of glass which is necessary to bring the ovum into focus kills the worm. Hence we must pass over that part which intervenes between the development of the cells in the germinal vesicle and the expulsion of the egg, during which time the germinal vesicle disappears, impregnation takes place, the yelk-granules become dissolved or altered, and the ovum, after having received its final investments, is laid.

Development of the Embryo in Nais albida.

It has already been intimated that all the information which I have been able to obtain respecting the development of the embryo has been from the eggs of *Nais albida*, which were deposited in portions of a gelatinous Alga (*Glæocapsa*) that grows on the sides of old walls and gutters in the island of Bombay, during the rainy monsoon. By what means, in addition to the contractile power of the delicate oviduct, the eggs are expelled, I am ignorant ; but having frequently observed species of this *Nais* with enlarged ova, in the midst of, and dragging themselves through, the gelatinous substance of the Alga mentioned, to which the eggs are thus agglutinated, it does not appear improbable that the resiliency of this substance may, to a certain degree, assist the *Nais* during delivery.

The ovum of this worm (fig. 39) is elliptical and slightly bent upon itself. It averages about 1-55th part of an inch in length, and consists of a transparent, coriaceous shell (*a*), terminated by a thickened, irregular, papillary portion at each end, from the inner aspect of which a kind of chalaza (*b*) is continued on to the yelk-bag (*c*).

Each yelk-bag contains two yelks (*d, d*), which respectively undergo more or less irregular duplicative subdivision, of which the following is a summary: viz. during the first stage, or that of the larger fissuration, the mass becomes triglobular (39 *d*), after which only one of the divisions appears to undergo *minute* division, while the other two either remain passive or undergo what may be termed crypto-division, for their substance certainly passes into minute cells, in whatever way this may be effected (40, 41). As the fragmentation thus goes on, the trilobate mass becomes elongated, by the two unfissurating lobes uniting more intimately to form one part, while the fissurating one forms the other (42); and the two extremities of the embryo becoming approximated like the ends of a horse-shoe, it thus lies confined by a delicate membrane, in a somewhat compressed globular form, with a notch in one part of the margin (43).

The notch now extends inwards towards the abdominal limit, when the two halves of the worm thus become separated, and the part which underwent the *visible* fissuration appeared to me to be the head. The young *Naides* now burst through the delicate cell which appears to surround them respectively, and, becoming free in the cavity of the shell (44), travel round it for some time until they have gained sufficient strength to force an opening through one end of it, when they thus make their exit.

I had not many opportunities of watching the development of the embryo (which occupies about five days), because I only discovered the eggs of the *Nais* mentioned towards the end of "the rains," when the *Glewocapsa* was dying off, and these *Naides* also appeared to get weaker and perish with it; but out of about two dozen eggs, many of which I got within twenty-four hours after they had been deposited (for they were laid in my room), sufficient observations were obtained to enable me to give the above description and accompanying illustrations.

How the double yelk is produced, when only one ovum is developed at a time, I am unable to state; but, from one observation, I am inclined to think that the first line of fissuration determines this, viz. from the masses becoming permanently detached at this time, and the rest of the fissuration going on in them separately.

On one occasion I obtained an egg which appeared to belong to *N. fusca*, and contained three or four embryos; but un-

luckily the watch-glass containing it was upset, and thus the means of proving it to be so, by their further development, lost.

Abnormal Development of the Yelk.

If the yelk become abortive, fissuration does not appear to take place, but several sacs containing a fine granular matter are developed in the midst of its substance (fig. 45), while gradually this fine granular matter becomes transformed into globular cells, each of which contains a yellowish refractive oil-globule, if it be not a nucleus (*a, a*). As this is taking place, the sacs, which are now plastic and endowed with motor power, put forth respectively a tubular prolongation, which, on reaching the shell of the ovum, becomes suddenly diminished in calibre, and thus passes through it in an attenuated form (*a, a*); or the sac may assume nothing but a tubular form from the first, and, after penetrating the shell, expand into a globular or conical shape, ending in a narrow papillary eminence (*d*). Finally, the extremity of the tube, in both forms, yields to the pressure of the internal contents, which now rapidly issue, one after another (*b*), in the form of monociliated monads, about 1-5600th of an inch in diameter (46 *a*). These, after swimming about for a short time, become fixed, and the next day may be observed to have lost their cilium and to have put forth a short tube (*b*), after the manner of the parent sac; but whether this ends in another division of their contents into still smaller monads, or they thus perish, I am ignorant.

This development of the yelk, which does not occur if it become putrescent, is but another instance of what I have shown to take place in the protoplasm of the spores, &c., of *Algæ**, when arrested in its progress to assume the likeness of the plant from which the spore has been produced; that is to say, that instead of doing this in either instance, the contents of the ovum and the spore respectively become transformed into monads, and finally into rhizopodous cells—that is, reduced to the lowest form of organic life with which we are acquainted.

I have stated that the sacs in the yelk “put forth tubular prolongations;” and this is done in the following way (if I may judge from similar sacs putting forth similar tubes under similar circumstances in the algal cell): viz. the endoplasm or protoplasm, whichever term is adopted, appears to be compelled to obey a law by which its surface becomes covered with a pellicle, and this pellicle again compelled by another law to harden soon after it has been formed; thus circumstanced, the endoplasm carries a pellicle with it, that corresponds in every way to its

* *Annals*, vol. i. 3 ser. p. 35, &c. pl. 3. figs. 13-15, and vols. xvii. & xix. 2 ser.

shape, wherever it goes, and whatever form it assumes; which pellicle, on hardening, takes on the form given to it by the protoplasm, and thus the tubular prolongation is produced; it is, in fact, only an instance of the way in which all organic forms are developed, viz. by the moulding power of the protoplasm, which in this case, however, has lost its specific nature.

Filaria in *Nais albida* (fig. 50).

Among the figures illustrative of this paper will be observed one of a *Filaria*, which I frequently found singly and in variable plurality in the peritoneal cavity of *Nais albida*, which worm, I have already stated, was met with accidentally in a species of *Glaucocapsa* that abounds with microscopic *Filariæ* during the rainy season. This *Alga* having been collected for this purpose, I shall defer further mention of this fact than that which will be found in the explanation of the figures, until I come to describe these *Filariæ* generally, which I propose to do on a future occasion.

Bombay, 24th April, 1858.

EXPLANATION OF PLATES II., III. & IV.

N.B.—Wherever the species from which the figure has been taken is not mentioned, it must be assumed to be *Nais fusca*.

For the purpose of conveying some idea of the relative size of many of the objects, they have been drawn upon a scale of 1-12th to 1-5600th of an inch, and their measurements given in 5600ths, with the same view.

PLATE II.

Fig. 1. *Nais fusca*; natural size.

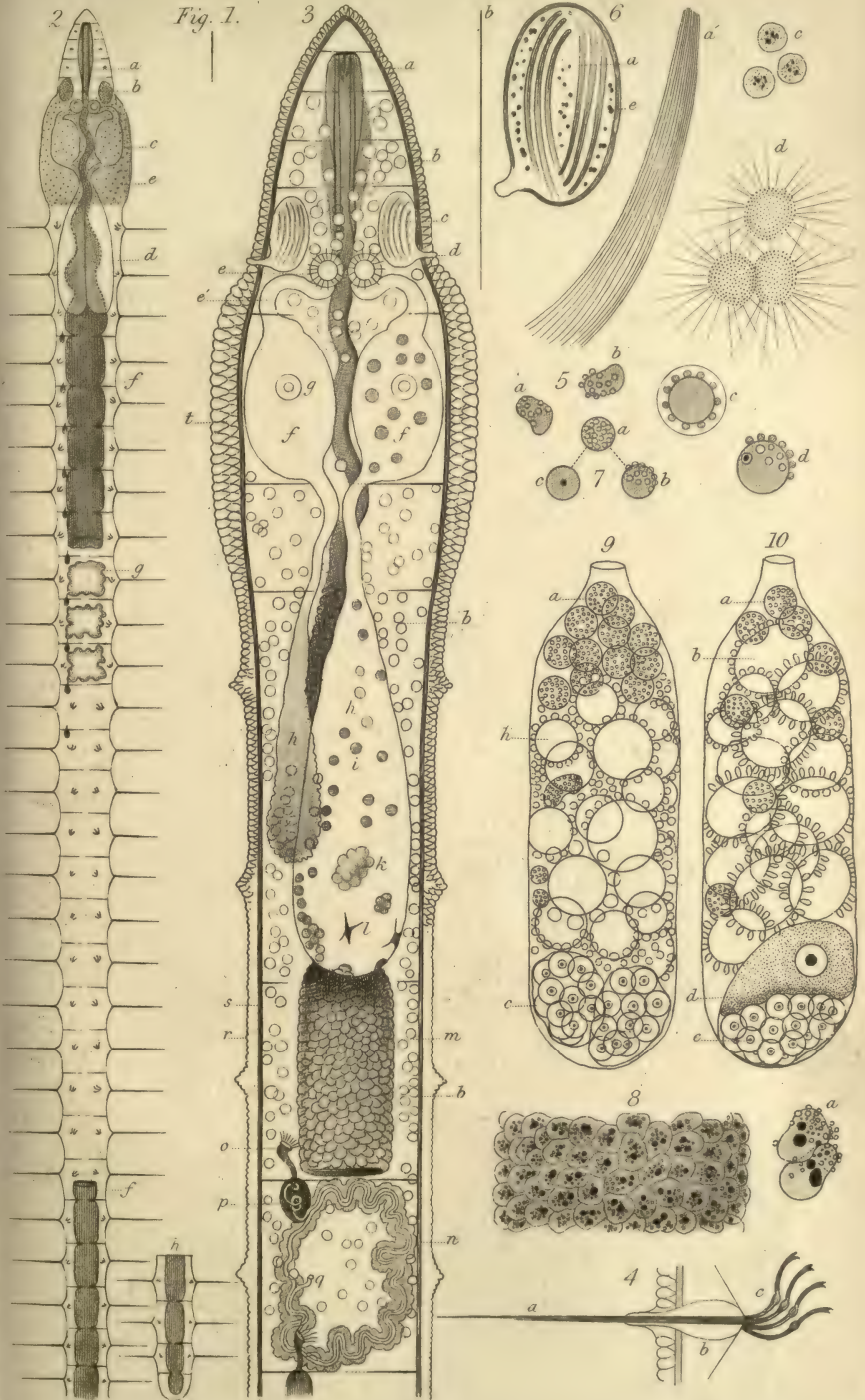
Fig. 2. Ditto, proportionally magnified, showing—*a*, œsophagus; *b*, testes; *c*, oviducts, or so-called “uteri;” *d*, ovisacs; *e*, reproductive band; *f, f*, intestine; *g*, segmental organ; *h*, continuation of worm. (The central part of this figure is not filled-in, to save trouble.)

Fig. 3. Ditto, anterior part, still more magnified, showing—*a*, œsophagus; *b, b, b*, floating-cells in the peritoneal cavity; *c*, testes; *d*, orifices of spermatid ducts; *e*, ciliated openings of *e'*, the so-called “fallopian tubes;” *f*, oviducts, or so-called “uteri;” *g*, vaginal openings of ditto; *h, h*, ovisacs; *i*, floating-cells in cavity of ditto (see the same also, fig. 12 *a, e*, more magnified); *k*, ditto, agglomerated (afterwards forming granular masses); *l*, ditto, caudate (for a more magnified view, see fig. 13 *a, f, d, e*); *m*, intestine, covered with hepatic cells; *n*, segmental organ; *o*, ciliated or internal opening of ditto; *p*, elliptical portion of ditto; *q*, external opening of ditto; *r*, external or cellular sheath; *s*, internal or structureless sheath; *t*, reproductive band.

Fig. 4. Magnified view of cirrus and setæ: *a*, setæ; *b*, bulb of ditto; *c*, cirrus.

Fig. 5. Cells of reproductive band, diffuent in form, about 2-5600ths of an inch in diameter when spherical (drawn on a scale of 1-12th to

Fig. 1.





1-5600th of an inch): *a*, with cell-wall; *b*, without cell-wall; *c*, imaginary section of spherical form, more magnified, to show the relative position of cell-wall, vesicles, and albuminous sphere; *d*, spherical form of ditto without cell-wall, showing the vesicles still adhering to the albuminous sphere, also the nucleus.

Fig. 6. Testes, so-called, magnified, containing bundles of spermatozoa (*a*) and granules (*e*): *a'*, bundle more magnified; *b*, single spermatozoon; *c*, sperm-cells from testes containing the characteristic brown matter (on same scale as fig. 5); *d*, globular masses of granules bearing spermatozoa from ditto, of which the component parts are proportionally magnified, each mass about 3-5600ths of an inch in diameter (on same scale as fig. 5); *e*, loose granules.

Fig. 7. Floating-cells, magnified (on same scale as fig. 5): *a*, with cell-wall; *b*, without cell-wall; *c*, after the bursting of the vesicles, showing nucleus (fig. 5 *c*, *d*, are also equally characteristic of the composition of this cell).

Fig. 8. Portion of intestine magnified, to show the layer of hepatic cells (the larger dark spots represent the bile-globules): *a*, two hepatic cells still more magnified.

Fig. 9. Ovisac with spermatozoa and groups of ova in first stage of development: *a*, sperm-cells (identical in appearance with floating-cells), about 2-5600ths of an inch in diameter; *b*, granular masses surrounded respectively by spermatophorous vesicles (see a more magnified view of one of these masses, isolated, fig. 14); *c*, two groups of ova, each about 10-5600ths of an inch in diameter, of which the ova are about 2-5600ths of an inch in diameter each.

Fig. 10. Ovisac with ditto ditto in second stage of development: *a*, spermatie cells unaltered, or with a little brown matter in their interior, as before. (From the constant ingress of floating-cells, even to the end of the development of the spermatozoa, there are always some of these in their primary stages present at the mouth of the sac, and therefore some are frequently found here in all stages of development; but with each impregnation, the ovisac appears to be cleared of everything except the remaining ova.) *b*, granular masses surrounded by the spermatophorous vesicles, now become conical (see fig. 16); *c*, single group of ova; *d*, single ovum with germinal vesicle, more advanced in development than the rest.

PLATE III.

Fig. 11. Ovisac with group of ova and spermatozoa in third stage of development: *a*, spermatie cells unaltered; *b*, granular masses surrounded by vesicles now pedicelled (see fig. 17); *c*, group of ova; *d*, ovum more advanced; *e*, another, less advanced; *f*, more magnified view of germinal vesicle, showing nuclei or points in endoplasm.

Fig. 12. Ovisac with spermatozoa fully developed: *a*, sperm-cells unaltered; *b*, spermatozoa developed and separate from the granular masses (see fig. 19); *c*, group of ova; *d*, ovum just previous to the disappearance of the germinal vesicle; *e*, effete granular masses; *f*, germinal vesicle more magnified, showing the nuclear points surrounded by cells, and the nucleus or germinal spot perishing or in progress of dissolution.

Fig. 13. Sperm-cells from the ovisac (on same scale as fig. 5): *a*, spherical form; *b*, diffuent form; *c*, undergoing fission in the mother-cell (the only instances of this kind that I have observed have

been in the ovisac, never in the peritoneal cavity); *d*, agglomerated, presenting the "brown matter" (represented by the dark shades) and isolated groups of vesicles in different parts; *e*, caudate form, also containing a little of the "brown matter;" *f*, single spherical sperm-cell presenting the "brown matter" in its interior.

Fig. 14. Granular mass with vesicles, in the first stage of development, 4-5600ths of an inch in diameter (on same scale as fig. 5). This is the smallest "granular mass" that I have met with, though probably not the smallest that exists, as there must be some not larger than the albuminous sphere of the floating-cell (see fig. 27).

Fig. 15. Ditto, ditto, 15-5600ths of an inch in diameter (on the same scale). These two figures show the relative difference in size of the granular masses which compose the sperm portion of the contents of the ovisac.

Fig. 16. Granular mass (11-5600ths of an inch in diameter) with vesicles in second stage of development, *i. e.* when the latter become conical, and the matter of the granular mass coarser: *a*, vesicles.

Fig. 17. Granular mass (10-5600ths of an inch in diameter) with vesicles in the third stage of development; granular matter still coarser.

Fig. 18. Granular mass (5-5600ths of an inch in diameter) with spermatozoa still further developed, and attached in two groups.

Fig. 19. Granular mass with spermatozoa fully developed and separate, though still retaining the vesicles at their ends (and probably over their whole bodies, for it is so delicate that the spermatozoa can hardly ever be said to be out of the vesicle until no appearance of it is left).

Fig. 20. Granular mass contracted after long exposure to water, showing that sometimes there is a thin pellicular cell left in contact with the developed spermatozoa, though it probably amounts to nothing more than a surface-condensation, and not a real cell.

Fig. 21. Five figures showing the progressive formation of the spermatozoon, from the daughter-cell in the vesicle (according to Kölliker) to the common form under which the spermatozoon presents itself both in the testes and ovisac: *a*, vesicle with daughter-cell, according to Kölliker; *b*, spermatozoon with both extremities extruded from the vesicle, which is kept distended in the centre by the elasticity of its coils.

Fig. 22. Granular mass (8-5600ths of an inch in diameter) with spermatozoa attached in four groups.

Fig. 23. Granular mass with spermatozoa attached in one group.

Fig. 24. Granular mass with spermatozoa attached all over the mass, but, by a current of water, all drawn in one direction, showing how they may become "bundled" under these circumstances.

Fig. 25. Granular mass covered with vesicles, through some of which the caudal ends of the spermatozoa are projecting.

Fig. 26. Granular mass (7-5600ths of an inch in diameter) covered with vesicles of the largest size, viz. 2.5-5600ths of an inch in diameter; on the same scale as fig. 5. A few only of the vesicles are figured here, for the purpose of showing that the material of the granular mass is always extremely fine when surrounded by the larger vesicles. *a*, vesicle more magnified; *b*, after long exposure to water, showing that when its refractive contents become contracted, they assume a granular form, accompanied by a nucleus.

Fig. 47. *Nais albida*, natural size.

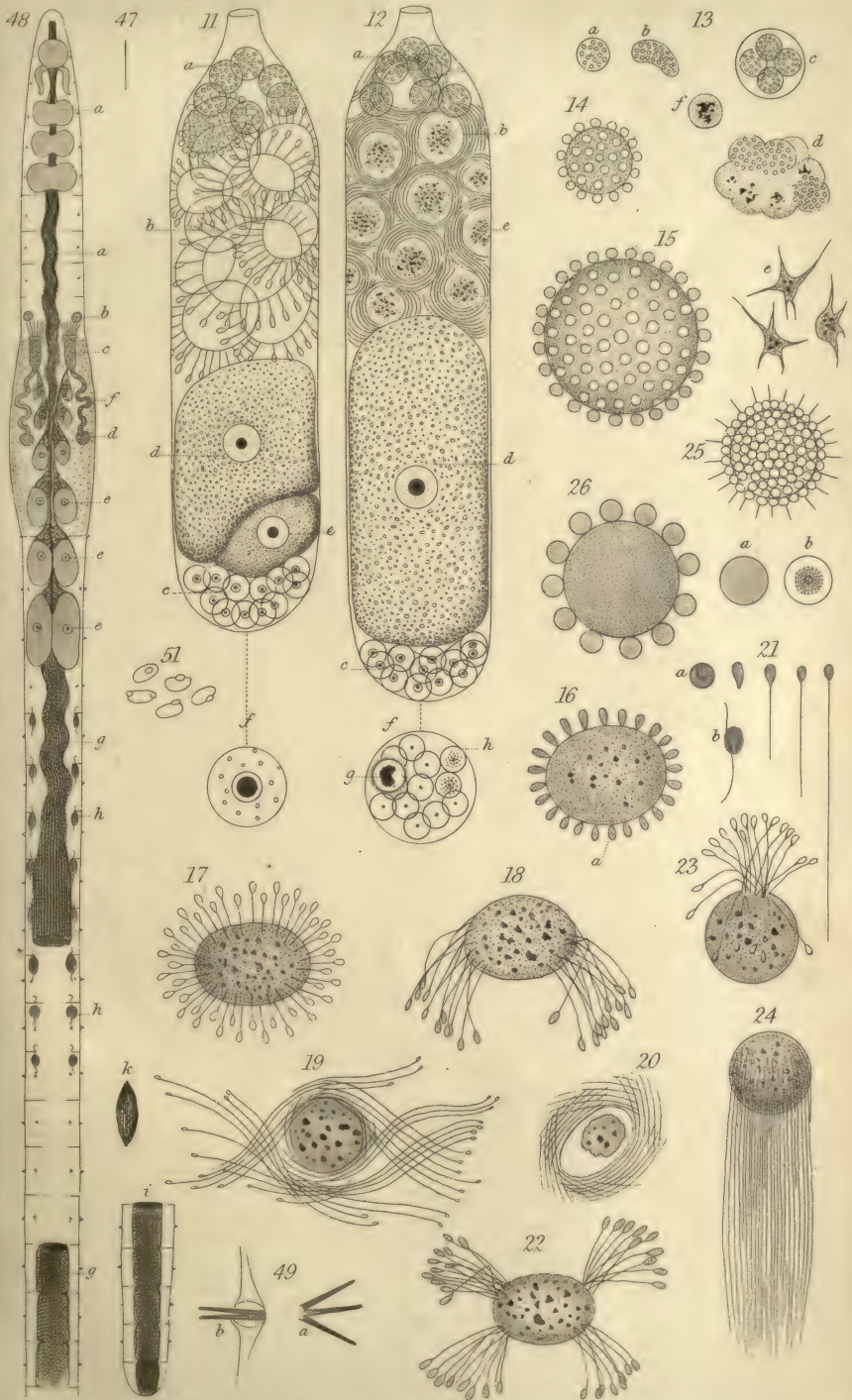




Fig. 48. Ditto, magnified : *a*, œsophagus surrounded by glandular masses ; *a'*, ditto, covered with hepatic cells ; *b*, testes, so-called ; *c*, so-called fallopian tubes ; *f*, oviducts ; *d*, vaginal openings of oviducts ; *e, e*, ovisacs, each consisting of several bunches of ova in a string, in each of which bunches one ovum is more developed than the rest, and the posterior in each string the largest ; *g, g*, intestine ; *h*, segmental organs, double, one on each side ; *i*, continuation of the worm ; *k*, floating-cell, more magnified.

Fig. 49. Cirrus and setæ : *a*, cirrus ; *b*, setæ.

Fig. 51. Large yelk-granules (3-5600ths of an inch long), magnified, to show apparent budding.

PLATE IV.

Fig. 27. Group of three cells, each of the same size as the sperm-cells, viz. 2-5600ths of an inch in diameter (on the same scale as fig. 5), bearing spermatozoa almost fully developed, attached to their periphery.

Fig. 28. Granular mass (4-5600ths of an inch in diameter), bearing a bunch of spermatozoa enclosed in a common membrane ; on the same scale as fig. 5. This membrane, which may be part of the plastic cell-walls of the agglomerated sperm-cells forming the granular mass, was hardly perceptible, in its natural position, from its extreme tenuity and closeness to the spermatozoa ; it is here placed at a distance, to show that there was one. See also in this figure the "abortive vesicles" (?) which appear as granules in the hepatic cell, and another instance of the way in which the spermatozoa become bundled.

Fig. 29. Nucleated cell 4-5600ths of an inch in diameter (one of the large vesicles of fig. 26 ?), containing several daughter-cells, each bearing a single spermatozoon (on the same scale as fig. 5).

Fig. 30. Ditto, ditto, with the spermatozoa liberated and in the parent-cell.

I am not quite certain of the facts which these two figures appear to substantiate, because the contents of a cell on becoming contracted are apt to mislead. My impression, however, is, that these cells did really contain spermatozoa in the two stages of development represented.

Fig. 31. Granular mass from the testes of *Nais albida*, surrounded by vesicles, through which the tails of the spermatozoa are projecting.

Fig. 32. Ditto, ditto, more advanced (the vesicles of the centre not introduced, that the granular mass may be shown).

Fig. 33. Ditto (4-5600ths of an inch in diameter), from ditto, with the spermatozoa nearly developed, showing that it is the head which is attached to the granular mass.

Fig. 34. Spermatozoon of *Nais albida*, fully developed ; 8-5600ths of an inch long.

Fig. 35. Granular mass (5-5600ths of an inch in diameter) from the testicle of *Ampullaria*, bearing, at the same time, spermatozoa, a bile-globule (*a*), and abortive granules (*b*).

Fig. 36. Ditto (6-5600ths of an inch in diameter), from ditto, bearing two bile-globules.

Fig. 37. Sperm-cell of *Ampullaria*, bearing a bundle of spermatozoa with the tails extruded ; 1.5-5600th of an inch in diameter (on the same scale as fig. 5).

Fig. 38. Spermatozoon of *Ampullaria*, 8-5600ths of an inch long.

- Fig. 39. Egg of *Nais albida* (ad nat. del.), showing—*a*, shell; *b*, chalaza; *c*, yolk-bag; *d, d*, two yolks, each of which is now triglobular.
- Fig. 40. Ditto, ditto, with one division only fissurating, and small cells without apparent fissuration appearing in the other two, which have become united.
- Fig. 41. Ditto, ditto, ditto, more advanced.
- Fig. 42. Ditto, ditto, ditto, with the two unfissurating lobes undistinguishably united, and forming one-half of the embryo, while the other lobe forms the other half, and is still further advanced in fissuration.
- Fig. 43. Ditto, ditto, ditto, with fissuration complete, and the halves still united, but foreshadowing the line of separation, which extends from the notch inwards.
- Fig. 44. Ditto, ditto, with the two embryos fully developed.
- Fig. 45. Ditto, ditto, showing the development of sacs in the yolk, and subsequent production of monads: *a*, *a*, sac filled with granular matter passing into monads; *b, b*, sacs with fully developed monads leaving them; *c, c, c*, sacs from which all the monads have escaped; *d*, tubular form, in which the sac appears outside the shell of the ovum; *e, e*, effete contents of the yolk.
- Fig. 46. Monads, more magnified (less than 1-5600th of an inch in diameter): *a*, just after exit; *b*, after loss of the cilium and commencement of tubulation.
- Fig. 50. *Filaria* frequently found singly, or in more or less plurality, in the peritoneal cavity of *Nais albida*: *a*, œsophagus in a sheath; *b*, intestine enclosed in the hepatic sheath; *c*, anus; *d*, vulva; *e, e*, double ovisac.

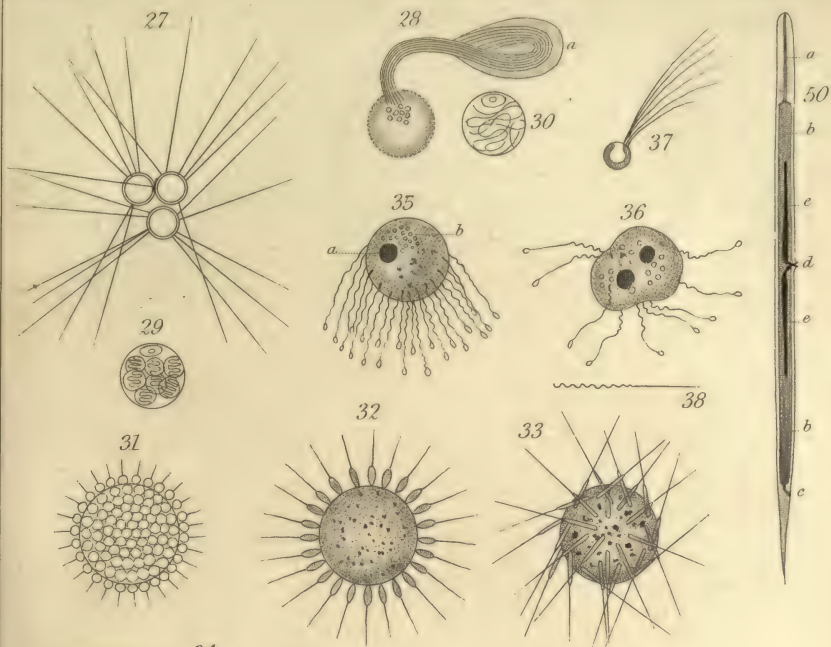
X.—Note on the smaller British species of *Pisidium*.

By the Rev. L. JENYNS, M.A., F.L.S. &c.

SINCE the publication of my monograph on the British species of *Cyclas* and *Pisidium* in 1832*, I have received at different times, through the kindness of correspondents, many specimens of the smaller species of the latter of these genera, from various localities, for identification and comparison. Having lately had occasion to re-examine some of these more closely, I am induced to offer a few remarks respecting them for the benefit of those naturalists who interest themselves with these little mollusks.

Pisidium Henslowianum.—Fine specimens of a shell, measuring nearly $2\frac{1}{2}$ lines in length, and exactly agreeing with this species, except in being entirely destitute of the lamelliform projection on the umbones, have been sent me from Ackworth, near Pontefract, and others from Ambleside, by Mr. J. W. Watson of the former place. From the absence of the appendage alluded to, I was for some time doubtful whether I was right in referring these shells to the *P. Henslowianum*, or whether they ought not more properly to be considered as large individuals of *P. pulchellum*. But on lately giving them a closer inspection, I per-

* Camb. Phil. Trans. vol. iv. p. 289.





ceived that one of the smaller specimens from Ambleside *did* possess the appendage in question, though not quite so much developed as in the Cambridgeshire ones in my collection. This satisfies me that the appendage is not an essential character; and there being scarcely any other character, except greater size, by which the *P. Henslowianum* can be distinguished from the *P. pulchellum*, I am inclined to the opinion that these two constitute but one species, the former being only one of the numerous forms which this variable shell is liable to assume. There is no difference in the animal, nor in the habits of the two kinds respectively. If the *P. Henslowianum*, from any other yet to be discovered characters, be really distinct, I conceive that the normal form is rather the variety *without* appendages than the one with them, as the former seems the more plentiful of the two, and includes the largest specimens I have seen. Possibly the appendages are liable to wear off with age, especially in running water, where they are necessarily exposed to more friction.

Pisidium pulchellum.—There are three principal varieties of this species described by me in my monograph. For the first of these,—under an idea expressed formerly by myself, that it might constitute a distinct species,—Dr. Gray, in his edition of Turton's 'Manual of the Land and Freshwater Shells of the British Islands,' did me the honour to propose the name of *Jenynsii*. But I do not believe now that this variety is any more distinct from the var. β of my monograph, than both these varieties, as well as others not calling for any particular notice, are distinct from the *P. Henslowianum*. And as the latter name is of prior date to *pulchellum*, in respect of publication, I should propose that it be the one in future adopted as the general name for this species with its many varieties, more especially as it is to Professor Henslow that we owe the original discovery of both the species now brought together.

The variety which Dr. Gray has termed *Jenynsii* differs from the more ordinary form of *pulchellum* by the striæ being more deeply cut, and the shell being broader in proportion to its length. But, as regards the variation of the striæ, we have a somewhat parallel case in the two varieties of *P. amnicum* noticed in my monograph, and formerly considered by Dr. Leach as two distinct species, under the respective names of *Pera fluviatilis* and *Pera Henslowiana*. There can be no doubt that these last, of each of which I have specimens from the identical streams from which Dr. Leach received his, are mere varieties; nor is there any more doubt, in my opinion, that *Jenynsii* and *pulchellum* are likewise mere varieties of one species, dependent upon water and other local circumstances.

As I have here proposed to unite *Pisidium Henslowianum* and *P. pulchellum* of my monograph under one species, giving it the name first mentioned,—if it be thought desirable still to retain a name for that variety which is so peculiarly distinguished by the umbonal appendages,—it might be called var. *appendiculata*, which was the name given to it by Dr. Leach, after he had transferred that of *Henslowiana* to the variety of the *P. amnicum* above alluded to.

Pisidium pusillum.—Mr. Watson of Ackworth sent me, along with the *P. Henslowianum*, specimens of a shell from that neighbourhood, not to be distinguished from *P. pusillum*, except by their far greater size, some of the individuals measuring $2\frac{1}{4}$ lines in length. I have received others from Suffolk of the same size, but rather more tumid, and nearly $1\frac{3}{4}$ line in thickness; form exactly similar.

Other specimens sent me from Preston Moor by Mr. Gilbertson agree likewise exactly in form with the *P. pusillum* of my monograph, but have the striæ deeper cut in proportion to their larger size, which exceeds that of even the Ackworth and Suffolk specimens, some being $2\frac{1}{2}$ lines in length, but they are not quite so tumid as the latter.

Specimens from Guisborough, likewise sent by Mr. Watson, are nearly $2\frac{3}{4}$ lines in length, but are slightly more compressed in proportion to their size than those from Preston Moor, though in other respects similar; and some of these Guisborough ones are scarcely to be distinguished, either in form or colour, from the *P. cinereum* of Alder (judging from a series of specimens kindly sent me, some years back, by that gentleman himself), except that the *P. cinereum* is rather more compressed still.

From all the above, I am inclined to think that the *P. pusillum* and *P. cinereum* are not distinct; though never having seen the animal, or noticed the habits of the latter, I would not wish to be considered as speaking positively on this point. I observe, too, that Forbes and Hanley, in their 'British Mollusca,' mention a variety of *P. cinereum* which is "rather more ventricose, and produced at the umbones," whereby the species is brought into close approximation with some of the varieties of *P. pusillum* above alluded to.

Pisidium obtusale and *P. nitidum*.—Of these two species I have never received specimens from any of my correspondents, unless a few doubtful individuals, sent from Aberdeen by the late Prof. Macgillivray, be referable to the *P. obtusale*. Hence I conclude that they are much less generally distributed than the other species of this genus. Having, however, occasionally had shells sent me which were erroneously supposed to belong to the species in question, I must again caution collectors against

deciding hastily on any of these small bivalves, without seeing the living animal. This remark applies especially to the *P. nitidum*, which in general form is so similar to the *P. pusillum*, and in which, when the animal has been suffered to die in the shell, a dark stain arises on the upper part of the valves near the hinge, rendering the umbonal striæ, one of the most distinguishing characters of this species, very difficult to perceive.

June 29th, 1858.

XI.—On the Nature of the Sub-basal Membrane of *Adamsia palliata*. By PHILIP HENRY GOSSE, F.R.S.

THE clear brown membrane which covers the greater part of those shells on which the *Adamsia palliata* is adherent was long ago carefully described by Dr. Coldstream*. Its chemical composition and its nature were, however, still left undetermined; and its very origin was, only as a *probability*, attributed to the *Adamsia*. It has since been suggested,—though, so far as I know, only conjecturally, no evidence having been adduced to confirm the supposition,—that the membrane in question is an incipient corallum, in which case it might be expected to show traces of a calcareous formation.

A specimen just sent me from the Clyde has afforded me an opportunity of setting the question at rest. The *Adamsia*, a mature specimen, was attached to an old worn shell of *Trochus ziziphinus*. When I obtained it, life had ceased; and though decomposition had not set in, yet the base was beginning to separate from the support. When this separation had proceeded a little further, I found that the basal surface of the body was covered with a thin film of the clear yellow membrane, where it had been adherent to the outer lip of the *Trochus*. This film was easily detached from the animal; and this I subjected first to microscopical examination.

Under a power of 600 diameters, with transmitted light, the membrane showed the manifest characters of an epidermic slough, —a clear, structureless layer, with a multitude of irregular minute granules, a few oil-globules, a good many scattered *Cnidæ*, and some *Diatomaceæ* of various species, some of which were alive and moving actively. Exposed to a red heat, this epidermic membrane *became charred, without the slightest shrivelling*, or shrinking, or change of form or dimensions.

The film above described seems to have been a newly-forming structure. When the decomposition of the animal had some-

* Johnston's Brit. Zooph. ed. 2. p. 208 *et seq.*

what advanced, I easily removed it from its attachment entire, revealing the form of the shell. Of this I found that there existed only the middle whorl, the apical whorls having been broken off, apparently a long time since, and the whole of the body-whorl being deficient. The portion that remained of the shell was closely invested with the membrane, of a translucent, dark-greenish horn-colour; and this was projected from the broken edge of the shell, and continued *alone*, as a new body-whorl, formed wholly of membrane. This adventitious whorl had followed the general course of the shell-spire, but was looser and more elongate, resembling the spire of a *Vermetus*; it was projected for a full inch beyond the broken termination of the shell, and ended in a wide, irregularly-rounded mouth, with the inner lip greatly receding.

The substance of this membrane was firmer and tougher than that of the film above described; but under the microscope it agreed with it in structure, except that it was denser. I then proceeded to examine it chemically.

A large piece cut out, and laid on a plate of thin glass, I first dried, and then exposed to a red heat: *it charred, without losing its form*. I then cut out other portions, and tested them successively with the following reagents:—alcohol, water, solution of potash, acetic acid, Pettenkofer's test, nitric acid, and hydrochloric acid. Of these, alcohol, water (cold and boiling), solution of potash (cold and boiling), acetic acid (cold and boiling), produced only a negative result, the membrane remaining *perfectly unaffected* by each. Pettenkofer's test evolved *no colour*. Nitric acid (boiling) at once caused the membrane to dilate and thicken, and in a few minutes *quite dissolved it, without any colour*, except the yellowish tinge produced by the liberated colouring matter of the substance. Hydrochloric acid (boiling) reduced the membrane to a very thin film, but did not quite dissolve it: *no colour* was evolved with this test.

The boiling was performed in a watch-glass over a flame.

Not the least effervescence was discernible from the immersion of the membrane in either of the acids while cold; nor any in the heated state, except what was due to the ebullition.

From all these tests, it is perfectly evident that the membrane is *not of a calcareous nature*, and that *it is composed of chitine*. Neither in its source (the epidermic layer), therefore, nor in its composition, does it present the slightest homology with a true corallum.

Torquay, July 21, 1858.

XII.—On the Winteraceæ. By JOHN MIERS, F.R.S., F.L.S. &c.

[Continued from p. 48.]

2. TASMANNIA.

THERE appears to be little difference between this genus and *Drimys*, the principal distinction being in its sometimes polygamous or monœcious flowers, and in its having occasionally, by abortion, only one or two ovaries; there is, however, a marked difference in the form of its stigma. The calyx is at first entire, and closed as in *Drimys*, and becomes divided into two equal hemispherical valves, which soon fall away. Endlicher erroneously describes the calyx as consisting of two flat sepals. One species has eight or ten petals, a second five or six, while in the third their number is sometimes reduced to two. The stamens are seated upon a short cylindrical gynophorus, in four rows, of which the outer series are shortest; the oval anther-cells, separated by an interval, are adnately fixed and partly immersed in the margin of the filament, and they burst by a lateral fissure. The ovaries, sometimes solitary, often two or four, are seated in the centre of the stamens; they are suborbicular, somewhat gibbous, with a sessile stigma in the form of a crenated crest, which runs from the apex down the inner side; they are unilocular, with a single longitudinal parietal placenta, which in the male flower is often sterile, but which in the female bears several ovules arranged biserially as in *Drimys*. The fruit is a berry, about the size of a large pea, with a furrow upon two opposite sides; it contains from fifteen to eighteen small reniform seeds, with a polished black exterior, and which in general structure appear to correspond with those of *Drimys*.

The species hitherto assigned to this genus are natives of Australia and Van Diemen's Land, where they form evergreen trees, the bark and leaves of which generally abound in an aromatic principle, as in *Drimys*. I have no hesitation in referring hither the *Drimys piperita* of Dr. Hooker, from the island of Borneo, where it is found at an altitude of 8000 feet. It agrees with *Tasmannia* in its flowers sometimes having no stamens, with a solitary carpel; and we often meet with hermaphrodite flowers, sometimes having only one, but more generally having four ovaries. Its fringed stigma, decurrent to the bottom of the ovary, corresponds with *Tasmannia*, and is quite at variance with that of *Drimys*: in like manner, the form and position of the anthers upon more elongated filaments differ from that genus.

The following is offered as an emendated character:—

TASMANNIA, R. Br.—*Flores monoici, polygami, aut hermaphro-*

diti. *Calyx* in alabastro clausus et indivisus, ovato-globosus, summo apiculatus, demum lacerato-partitus in laciniis 2, rarius 3, concavis membranaceis parallele nervosis pellucido-punctatis reflexis, denique circumscissus, et deciduus. *Petala* 5-10, lineari-oblonga, 3-nervia, pellucido-punctata, expansa, 2-serialia, æstivatione parallela, apicibus quincuncialiter imbricatis. *Stamina* plurima, gynophoro subgloboso inserta, 4-seriata, quorum exteriora breviora, interiora gradatim longiora; *filamenta* longiuscula, loriformia; *antheræ* parvæ, 2-loculares, loculis oblongis, sejunctis, fere parallelis, margine filamenti utrinque subextrorsim adnatis, rima longitudinali dehiscentibus. *Pollen* globosum, obscurum, sulcis 3 signatum. *Ovaria* sæpe solitaria, aut interdum dua vel quatuor, staminibus 2-4-plo breviora et superposita, oblonga aut globosa, gibbosa, 1-locularia, in ♂ paullo minora et sterilia, in ♀ pluriovulata: *ovula* reniformia horizontalia in placentam parietalem longitudinalem ventralem biseriata. *Stylus* nullus. *Stigma* sessile, e summo introrsim decurrens, undulato-crenatum. *Bacca* solitaria (rarius plures), carnosa, globosa aut oblonga, 1-locularis. *Semina* plurima, reniformi-cochleata, angulata, apice affixa; *tunica externa* dura, nitida, atra, crystallino-crustacea, fragilis; *tunica intermedia* raphigera, bullata, carnosula; *raphe* immersa, simplex, e summo ad *chalazam* sinu proximam percurrent; *integumenta interiora* bina, tenuissime membranacea, distincta, sed ad *chalazam* crassiusculam inter se coalita. *Albumen* copiosum, cylindricum, in formam virgulæ curvatum, extremitate basali (*chalaza* tecta) hinc superne spectanti, apicali recta; *embryo* in verticem valde minutus cylindricus, *radicula* supera, *cotyledonibus* minutissimis centripetis.

Frutices sempervirentes in Australasia, insulis Novæ Zelandiæ et Borneo indigeni, monticoli, glaberrimi, plerumque oleo aromatico repleti; folia sparsa, integerrima, pellucido-punctata, petiolata; pedunculi terminales aut axillares brevissimi aut obsoleti; pedicelli plurimi, umbellatim aggregati, graciles, folio multo breviores.

1. *Tasmannia aromatica*, R. Br., DC. Syst. i. 445; Prodr. i. 73; Del. Icon. i. tab. 84; Bot. Reg. 2 ser. xvii. tab. 43; Hook. Fl. Tasm. i. 11. *Winterania lanceolata*, Poir. Dict. Méth. viii. 799. —In Australasia et Insula Van Diemen.
2. *Tasmannia insipida*, R. Br., DC. Syst. i. 445; Prodr. i. 78; Bot. Reg. 2 ser. xvii. tab. 43. *T. monticola*, A. Rich. Sert. Astrol. 50. tab. 19. —In Australasia, Port Jackson.
3. *Tasmannia piperita*. *Drimys piperita*, Hook. fil.; Hook. Icon.

896 ;—arbuscula glaberrima ; ramulis novellis, glaucis ; foliis concoloribus, oblongo-lanceolatis, utrinque attenuatis, integerrimis, undique glaberrimis, valde reticulatim venosis, imo in petiolum canaliculatum anguste decurrentibus ; pedicellis 2-3, unifloris, e pulvino axillari ortis, floribus monoico-polygamis ; calyce 2-partito ; petalis 8-10, lineari-oblongis, obtusis ; stamina circiter 30, aut nulla ; ovaria 1 ad 4.—Borneo ; *v. s. in hb. Hook.*

I have already stated some of my reasons for referring this plant to *Tasmannia* rather than to *Drimys*. The latter genus has been found only in the western world and in the islands of Juan Fernandez and New Zealand, the plants of which latter country present so many curious analogies with the extratropical flora of the South American continent. Dr. Hooker has given an admirable figure of this species ; and in describing it he acknowledges its close alliance to the genus *Tasmannia*, on account of its unisexual flowers and its few carpels, which are two of the principal characters that serve to distinguish this genus from *Drimys*. I have already alluded to the shape of its stigma, which has quite the peculiar form of that of *Tasmannia*, and to its stamens, which also correspond to that genus ; and to these features may be added, that its leaves are deficient of the peculiar glaucous under surface that universally marks those of *Drimys* ; they are, on the contrary, concolorous, extremely reticulated, and the petiole is slightly winged, as in *T. insipida*. I have observed, in the same specimen, female flowers with no stamens, and only a single ovary ; and hermaphrodite flowers with thirty stamens in four rows, and one ovary : others have four ovaries ; and in all three cases I found eight petals in two series.

3. ILLICIUM.

This genus is too well known, and its relation to *Drimys* and *Tasmannia* is too well established, to require much notice ; but I will offer a few observations upon its seed, which in its structure is quite analogous to that of the genera just mentioned. The best details of the generic features of *Illicium* are given in the admirable work of Dr. Asa Gray, 'The Genera of the United States,' where, in plate 21, there is an excellent analysis of *Illicium Floridanum*, from which we may conclude that there is no essential difference in the structure of the American and Asiatic species ; all that may be noticed is, that in the latter I have observed that the stamens are not introrse, as there seen, but that the anther-cells are imbedded laterally on each side of the fleshy filament, and that the three rows of stamens are fixed upon the outside of a very short gynophorus, in the summit of which the

verticillated ovaries are partly sunk. Dr. Gray describes the external brittle tunic of the seed as loosely adhering to the "obscurely sculptured surface of the spongy membranaceous inner integument." According to my observations on *Illicium anisatum*, the single seed, found in each of its follicles, is of an oval form, laterally much compressed, very hard and polished, and lies with its longest diameter horizontally and its transverse diameter vertically within the radiating pericarp, where it is attached to the axile placenta by its hilum, which there forms a large hollow cavity closed by a fungous substance: along its upper margin is a somewhat prominent ridge, which has been described as the raphe; but this is not correct, although the cord of the raphe exists below it, but in no way connected with it: this ridge is formed merely by the pressure of its growth against the corresponding sutural line of the pericarp. This outer shell of the seed is hard, crystalline, and somewhat brittle, consisting of a number of hexagonoid cylinders, which, under the microscope, appear formed of radiating spicula subsequently filled towards the external face with solid crustaceous matter; it is uniform in thickness and texture, except round the open mouth of its large basal aperture, which is closed by the fungous hilum; it is there somewhat thicker; it is lined throughout with a thin, pellicular, loosely adherent membrane with very distinct, large, oblong reticulations, and which is easily scraped off. Between this and the next coating is a layer of very elongated oil-cells or glands, in three or four adhering layers, which do not always run parallel with one another, but often cross, so as to form cancellated bands, thus producing the bullate and "sculptured surface" mentioned by Dr. Gray: these oil-cells are coloured, translucent, with a minutely dotted surface; and they dry into a brittle furfuraceous stratum, quite free from the surrounding integuments. The next tunic is very thick and fleshy, and may be detached in an entire state; it appears to be a continuation of the more solid or fungous hilar portion, near which it becomes gradually and considerably thickened: within the fleshy tissue of this integument is found the simple cord of the raphe, consisting of spiral and other vessels, which, originating in the hilum, runs along the upper margin, and terminates near the other extremity in the chalazal disk. The nucleus, which completely fills this sac, is considerably smaller, of an oval shape, somewhat less compressed, and a little rostrated where it points towards the hilum, which has a corresponding hollow for its reception; this is covered by two distinct membranes, of which the outermost or third integument is reticulated with long polygonoid areoles, while the next or fourth integument, which immediately invests the albumen, is somewhat

thicker than the former, and has very minute hexagonal reticulations, the areoles of which are smaller than the cells of the albumen: these two membranes are homogeneous throughout, and are easily separable from one another at all points, except at the chalaza, where, together with the second fleshy tunic, all three are intimately confluent. The albumen is fleshy; and imbedded in its substance, close to the rostrated point before mentioned, we find the embryo, which is extremely small and shortly cylindrical, the radicular end pointing to the hilum, the opposite extremity being cleft into two very minute gaping cotyledons. From these facts I infer that the outer testaceous shell is an arillus, developed probably from the placenta, and that the whole of the fleshy spongy coating (together with its included raphe and its fungous hilum) is a growth or expansion of the placentary sheath of the ovule, thus forming an investing entire sac, and assuming the peculiar condition which I have called an arilline* or fleshy development of the primine of the ovule.

The generic character, from my observations, may be thus defined.

ILLICIUM, Linn.—*Flores* hermaphroditi. *Sepala* 3 vel 6 petaloidea, membranacea, æstivatione imbricata, caduca. *Petala* 9 ad 30, patentia, 3-pluri-serialia, interiora angustiora et minora, æstivatione imbricata, decidua. *Stamina* indefinita (12 ad 40), pluriserialia, hypogyna, patentia; *filamenta* brevia, carnosula; *antheræ* adnatæ, loculis segregatis margine filamenti semi-immersis, sublateraliter dehiscentibus. *Ovaria* 5–15, compressa, sessilia, libera, suberecta, serie unica gynophoro brevi insidentia, 1-locularia; *ovula* solitaria, ex angulo basali adscendentia, anatropa. *Stylus* subulatus, recurvus, latere ventrali stigmatosus. *Folliculi* plurimi (5–15), coriaceo-lignosi, compressi, rostrati, liberi, circa gynophorum centralem stellatim adnati et horizontaliter radiantes, sub-2-valves, rima superiore hiantes, 1-loculares, monospermi. *Semen* oblongum, compressum, hilo majusculo excavatum et hinc ad axin centralem horizontaliter affixum; tunica externa crustacea, dura, ore calloso incrassata, extus vitrea et nitidissima, intus structura hexagonoidea reticulata, et crystalloidea; tunica secunda crassiuscula, superficie bullata, extremitate hilari crassa, raphigera, raphide simplici hilo orta per marginem superiorem protensa et chalazam attingente percursa; tunica tertia hyalina, tenuiter membranacea, areolis elongatis reticulata, versus angulum superiorem *chalaza* majuscula incrassata; tunica quarta pellucida, paullo crassior, areolis minutissimis hexagonis reticulata, ad albumen arete adhærens. *Albumen* co-

* Linn. Trans. xxii. 89.

piosum, carnosum, hexagonoideo-cellulosum, ovale, paullo compressum, versus hilum rostratum, hinc embryonem minimum claudens, *radicula* cylindrica, hilum versus spectante, et in *cotyledonibus* obtusis brevissimis centripetis fissa.

Arbusculæ Indicæ, Chinenses, Japonicæ, et boreali-Americanae sempervirentes; folia *alterna, oblonga, integerrima, glabra, coriacea, pellucido-punctulata, sæpe conferta*; flores *axillares vel in ramulis annotinis terminales, tandem ramuli novelli elongatione laterales*, pedunculis *solitariis aut ternis 1-floris*, petalis *purpureis aut flavescentibus*, capsulis *aromaticis vel insipidis*.

1. *Illicium anisatum*, Linn. Sp. 664; Gaertn. Fr. i. 338. t. 69; Dict. Méth. i. 351; Lam. Ill. t. 493. f. 2; DC. Syst. i. 441; Prodr. i. 77; De Vriese et Hoeven, Tijd. i. 31-45. t. 2.—In Japonia et China*.
2. *Illicium religiosum*, Sieb. et Zucc. Fl. Jap. i. 5. t. 1; Bot. Mag. t. 3965; Walp. Rep. i. 74.—In Japonia.
3. *Illicium Griffithii*, Hook. f. & Th. Fl. Ind. i. 74.—In montibus Khasia.
4. *Illicium Floridanum*, Ellis, Phil. Trans. lx. 524. t. 12; Dict. Méth. i. 352; Lam. Ill. t. 493. f. 1; Gaertn. Fr. i. 339; Bot. Mag. t. 439; DC. Syst. i. 441; Prodr. i. 77; Gray, Gen. Un. St. i. 56. t. 21.—In Florida.
5. *Illicium parviflorum*, Mich. Fl. Bor. Amer. i. 326; Vent. Cels. t. 22; Hb. Am. t. 330; DC. Syst. i. 442; Prodr. i. 77.—In Florida.

4. TEMUS.

Of this genus nothing is known beyond the very imperfect description given by the Abbé Molina in his 'History of Chile;' and as no plant corresponding with it has since been found by any of the numerous collectors who have visited that country, the genus must be considered a very doubtful one. It was placed by DeCandolle between *Illicium* and *Drimys*, although the character ascribed to it by Molina was incompatible with them; but he considered that character to be, in all probability, erroneous, because a dicoccous berry is hardly consistent with the previous condition of two ovaries. It is described as a tree with alternate, thick, polished, oval, smooth, and bright green leaves, that emit a strong smell of nutmegs; terminal aromatic flowers, with a 3-fid calyx, eighteen linear petals, twenty-six stamens, two ovaries, and a dicoccous berry; the petals are linear,

* Analytical details of the fruit and seed of this species are shown in the 'Contributions to Botany,' plate 27 c.

flesh-coloured, two or three inches long; the filaments are setaceous and above half the length of the petals, with globose anthers; the seeds are arillate, with the flavour of those of coffee, only more bitter. This kind of fruit ill accords with the features of the *Winteraceæ*. Until further evidence of its existence, and better characters of its structure be ascertained, it ought to be restored to the list of the "genera incertæ sedis," in which it was placed by Jussieu. I cannot help thinking there must have been some confusion in the original notes of Molina: he describes his *Temus moschata* as furnishing an excellent and very hard wood, which cannot be of rare occurrence, as he says it is much used in Chile in various manufactures. The *Luma Cruckshanksii*, A. Gray (*Eugenia Cruckshanksii*, Hook.), which is abundant in the midland provinces of Chile, is known among the natives by the name of Temu; and it possesses a wood that answers the above description.

5. TROCHODENDRON.

This genus, established by Siebold and Zuccarini for a plant which the former botanist brought from Japan, has been fully described and figured in the 'Flora Japonica.' It has been referred to the neighbourhood of *Illicium*; but its characters seem quite irreconcilable with those of the *Winteraceæ*. The features which appear to me incompatible are—its verticillated leaves, which are serrated; its peculiar mode of budding; its flowers destitute of both calyx and corolla; its single plurilocular ovary; and its capsular fruit, opening by five to eight thick coriaceous valves; to which may be added, the different sort of integument by which its seeds are invested. On the other hand, in the habit of the plant, its serrated leaves, its numerous stamens, its many-celled ovary, with divided style, its capsular many-valved fruit, and the form and texture of its seminal integument, it approaches far nearer to the *Ternstroemiaceæ*; and it has several features in common with *Trochostigma*, also of Japanese origin (*Actinidia*, Lindl.), placed by some botanists in *Ternstroemiaceæ*, by others in *Dilleniaceæ*; but perhaps it comes still nearer to the Tasmanian *Carpodontos* (congeneric with *Eucryphia* from Chiloë), a genus of doubtful position placed between the *Chlenaceæ* and *Ternstroemiaceæ*. In the latter genus the corolla is very deciduous, and its opercular calyx at the period of æstivation falls off by a circumscissile line, —a character approximating to the seemingly achlamydeous flowers of *Trochodendron*.

XIII.—*Observations on the Genera Camptonyx and Tanysiphon of Benson.* By Dr. J. E. GRAY, F.R.S., V.P.Z.S. &c.

IN a preceding Number of the 'Annals'* I have pointed out the affinity of the genus *Camptonyx* to *Otina*, simply from the description of the animal; but, now I have had the opportunity of seeing the figures, I am convinced of the soundness of the comparison, and indeed I am almost induced to believe that *Camptonyx* is only a very slight modification or subsection of that genus, as the lateral groove is much slighter than I had expected, and the shell is an *Otina* as well as the animal.

I may further add, that the South American genus *Chilina*, which has been referred to *Auriculadæ* and *Lymneadæ*, if the figures and description of the animal by D'Orbigny and Dr. Gould are correct, is evidently another genus of the same family.

The figure of the teeth of *Camptonyx* does not justify the assertion of their similarity to those of *Ancylus*, as may be proved by comparing the figure in the 'Annals' with those of *Ancylus* given by Dr. Otto Goldfuss and others, or the description of the teeth of *Ancylus* and *Velletia* given by Mr. W. Thomson in the 'Annals.'

All that can be said is, that they have the normal teeth of the Pulmonata, with certain generic or specific peculiarities.

In the same Number of the 'Annals,' Mr. Benson described an interesting genus of freshwater bivalve mollusk found living in the slaty clay banks of the River Jumna.

I cannot understand how any conchologist could have doubted its distinctness from *Novaculina*, either malacologically or conchologically. It appears to me equally extraordinary how a shell with external cartilage and diverging cardinal teeth can be placed in *Myacidæ*, unless the latter family is to have a much more extended sense than I am willing to give to it. It appears to agree with *Mya*, as far as I can discover by the description, only in two particulars, for the number and extension or non-extension of the gills in the siphon are not noticed:—

First, that the siphons are united; and secondly, that the apex of the siphons near the aperture is surrounded with a ring of tentacles, and the aperture of the branchial siphon is bearded. The union and non-union, and the extent of the union of the siphons, have been proved, by the examination of a number of animals, not to be of much importance, certainly not affording a family character: indeed, very nearly allied genera of the same family frequently vary in these particulars; several genera besides *Mya*, with united siphons, have a ring of tentacles round the base of the two apertures.

* Ann. Nat. Hist. 3 ser. vol. i. p. 406.

So far as I can judge from the description of this genus, it appears to be very nearly allied to *Glaucanome*, which is found in the rivers of Asia, and it is chiefly separated from the known species of that genus by the siphons of the animal being united to the end, while in the animal of the only species of *Glaucanome* which has been observed, they are only united at the base; but the siphons of different species of several genera vary in the extent to which the siphons are united.

Mr. Benson observes, "the branchial siphon is ciliated in *Solecirtus*." Perhaps Mr. Benson intends by "cilia" tentacles or beards; for I am not aware that any of the conchiferous Mollusca have the siphons destitute of cilia. But the question is, what does Mr. Benson mean by *Solecirtus*? as that name has been given to a number of different animals. *Novaculina* is evidently most nearly allied to "*Tagel*" of Adanson (*Solen Guinensis*, Gmelin), to which I have given the name of *Tagelus* in my list of genera, so long ago as 1848, when I placed *Novaculina* as a subdivision of that genus; and Mr. Benson's figure, now first published, justifies that position in all particulars, and is very different from the *Solecirtus* of De Blainville (1824), which has *S. strigillatus* for its type.

Since the above was in type, Mr. Benson has kindly sent to the British Museum a specimen of each of these genera. They confirm the opinions above stated. *Tanysiphon* is evidently very nearly allied to *Glaucanome*, but is distinct in the teeth being more conical and less compressed, the hinder one shorter and less oblique, and especially in the cartilage and ligament being very short, and placed obliquely close behind the cardinal teeth; while in *Glaucanome* the cartilage and ligament are elongate and parallel with the cardinal edge, which is swollen into a well-developed fulcrum.

XIV.—*Gleanings in British Conchology.*

By J. GWYN JEFFREYS, Esq., F.R.S.

[Continued from vol. i. p. 48.]

[With a Plate.]

SINCE the publication of my former paper on this subject, several additions to the lists, both of species and localities, have occurred to me; these I will now take this opportunity of recording. They have been chiefly derived from the northern and southern extremities of the British Isles; and I have to express my best thanks to my friends Mr. Barlee and Dr. Lukis in particular, as well as to Mr. McAndrew, Mr. Waller, Dr. Battersby, the Rev.

A. M. Norman, and Mr. Spence Bate, for their valuable co-operation.

Some conchologists entertain a doubt whether the Channel Isles can be properly considered part of Great Britain for natural-history purposes, because their geographical situation places them nearer to the French than our own coasts; but the Sarnic fauna and flora (although peculiar) have always been considered British by our chief naturalists; and our continental neighbours have never, I believe, appropriated or claimed them as their own. Although this part of our sea-coast had been for several years past diligently explored by Mr. Hanley, Mr. Metcalfe, Mr. Barlee, and several other collectors, many species new to Great Britain have now turned up; some of them (e. g. *Triton nodiferus* and *cutaceus*, *Cardium papillosum* and *Argiope decollata*) being not only of a conspicuous size, but including one of the largest known European shells. The zeal and intelligence of Dr. Lukis will doubtless increase our knowledge of the Testacea in this district; and it is to be hoped that he may be induced to publish a special account of that branch of the Sarnic fauna. I have never myself had the good fortune to visit the Channel Isles; but through his kindness I have had and examined a quantity of shell-sand which was dredged up, by his directions, at a considerable distance from land, and at a depth of from 15 to 20 fathoms, and I have been thus enabled to form some idea of the conchological wealth and variety which appear to abound in this part of our seas. The shells from this district are principally of a Mediterranean character.

Mr. Waller also kindly sent me some shell-sand which he has lately dredged up from the Turbot Bank off the coast of County Antrim, at a depth of about 25 fathoms; and although I have not yet had time to examine it carefully, the contents (so far as a superficial view enables me to judge) deserve, in my opinion, special notice. What have been hitherto regarded as northern and southern forms are here found to be closely associated together. *Buccinum Holbölli*, *Scalaria* (?) *Eschrichti*, *Natica clausa*, *Margarita cinerea* and *Trophon scalariformis* (which are decidedly Arctic species), *Crania anomala*, *Trichotropis borealis* and *Puncturella Noachina* (according to the late Professor Edward Forbes, "Boreal" types), *Terebratula caput-serpentis*, *Lima subauriculata* and *Fissurella reticulata* ("Atlantic"), *Argiope cistellula*, *Trochus Montagui* and *Pecten tigrinus* ("British"), *Astarte sulcata*, *Buccinum undatum* and *Venus casina* ("Celtic"), *Artemis linctia*, *Corbula nucleus* and *Trochus cinerarius* ("European"), and *Rissoa striatula* ("Lusitanian"), all in the same fresh and apparently recent condition, are found to be collected in the same locality, as if on purpose to confound or perplex the theories of geographical

distributionists. As, however, few of these shells were taken in a living state, it may be said that some of them were fossil, or had been carried by submarine currents to the spot. Now, although no chemical or other test has yet been discovered for distinguishing what are called fossil from recent shells, whose cavities or tissue are not permeated by mineral matter, the general appearance of all the specimens in question, and their hyaline texture, instead of the dull aspect and opacity of fossil-shells from even the newest strata of the Tertiary system, sufficiently make out a *prima facie* case of their recent origin; while it is highly improbable that various currents would set in quite opposite directions for many hundred leagues, and bring shells from the very bottom of the sea to this particular locality. It is, on the contrary, as I submit, a fair inference, that all the Mollusca whose remains have been thus brought to light, lived and died within a few miles of the place of their ultimate sepulture. How far their continued submersion in the sea for many ages, beyond the reach of atmospheric influence, may have prevented any change in their composition, and given them a recent appearance, instead of that of true fossils, is another question, which I am not prepared to answer.

[Since the above was written, I have received from Mr. Waller a very interesting paper of his on the above subject, which has just been published in the 'Transactions of the Royal Dublin Society,' and to which I beg to refer my readers for an exposition of his views. I may observe, that the fragments of a shell which I at first supposed to belong to a *Turritella* allied to *T. polaris*, and which Mr. Waller has provisionally named "*Hibernica*," I have since ascertained to be the *Scalaria Eschrichti* of Holböll and *S. borealis* of Beck. The results of this dredging exploration are reserved for the next meeting of the British Association for the Advancement of Science, under whose auspices it was partly conducted; and I therefore abstain from making any further allusion to it.]

While mentioning shell-sand, it may not be amiss to remark that it ought to be carefully passed through sieves of various degrees of fineness before examining it; for otherwise the eye will be distracted by the unequal size of the objects submitted to it, and some of the smaller shells may be concealed from view by larger and coarser ones. If by chance this suggestion is adopted by French conchologists, I hope they will not be led by an accident of mistranslation into a similar error to that which I noticed in a recent number of the 'Journal de Conchyliologie,' in which I was said to recommend using the *dredge* to get up sea-weed from different depths of the sea, for the purpose of collecting minute shells!

With respect to the operations of my old friend and partner, Mr. Barlee, in the "*ultima Thule*," I regret to say that they have not this year been so successful as heretofore. With a view to greater results (the expenses being also much greater), we took into the firm Mr. Damon, the well-known and enterprising shell-dealer, who was to have the duplicates; but I fear his share of the spoil will much exceed ours. *Terebratula cranium*, *Cerithium metula*, *Mangelia nana*, *Aporrhais pes-carbonis*, *Trochus alabastrum*, and *Tellina balaustina* (all of them northern treasures) may be enumerated as the chief products of this expedition, so far as it has hitherto proceeded. The variable, and often tempestuous, state of the winds and sea, even during the height of summer, will always render the Shetlands an uncertain and unsatisfactory dredging-ground; although its high northern position, and the innumerable voes and fiords by which it is intersected on every side, afford unusual prospects of rarities, as well as shelter to the molluscous tribe. Mr. Barlee informs me that our dredger, Angus M'Nab, whom he took with him, has been most indefatigable, honest, and intelligent in performing his part of the work.

A frequent inspection of the cabinet of Mr. M'Andrew (who has been most liberal in the use of it) has enabled me to correct one or two mistakes which I had made in the identification of Mediterranean and British species, his collection of the former being perhaps unrivalled. It is impossible to define and distinguish with sufficient accuracy the shells of any isolated district without regard to those of other districts in the same geographical province; and my recent investigation of the Testacea of the Piedmontese coast satisfied me as to the importance, if not the necessity, of extending the area of observation for the above purpose. Mr. M'Andrew's collection of shells from the coasts of Upper Norway (which is also very rich) was likewise of great service to me; and it confirmed my former opinion, that, in general, the size of specimens increases in a ratio inverse to their northern, and converse to their southern, point of latitude, of which *Tellina balaustina*, *Cardium minimum* (*Suecicum*), *Rissoa pulcherrima*, *Trochus undulatus*, and *Arca raridentata* may be cited as examples. Colour appears to depend on different laws, and is generally more vivid in southern than in northern climes; for instance, *Cardium papillosum*, *Pecten furtivus*, and many others. In great depths it is indeed wanting, or nearly so, as may be seen by comparing specimens of *Venus ovata* and *Turritella communis* obtained from the coralline zone, and a depth of 100 fathoms.

I am indebted to the skilful and experienced pencil of my friend Mr. Alder for figures to illustrate this paper, as well as

for his assistance in determining many of the species now proposed to be added to the British fauna.

Acephala Lamellibranchiata.

Teredo Norvegica, Forbes & Hanl. *Brit. Moll.* vol. i. p. 66. Guernsey, in piles (*Dr. Lukis*).

Pholas parva, i. 111. Guernsey, with *P. dactylus*, in submarine wood and peat (*Dr. Lukis*).

P. candida, i. 117. Guernsey, with the last two (*Dr. Lukis*).

Saxicava arctica, i. 141. Guernsey, with *S. rugosa*; but I am not satisfied as to the distinctness of the two species.

S. ? fragilis (*Nyst*), Wood's Crag Moll. p. 288. tab. xxix. figs. *a-e*. *S. rugosa*, juv. ?, B. M. i. 149. pl. 6. f. 1-3, and iv. 248. In trawl-refuse from Plymouth; and I have it also from the Hebrides and Aberdeen. Mr. Searles Wood, who is now satisfied as to the identity of his fossils with the recent species, has mentioned that several dead valves were obtained from the beach on Stone Point, at Walton-on-the-Naze; and Mr. M'Andrew dredged it in Vigo Bay,—so that it has an extensive range. There can be no question of its being quite distinct from *S. rugosa*, if indeed it belong to the same genus.

Panopæa Aldrovandi, i. 178. A pair of this magnificent shell was brought to me many years ago, as having been taken in a trawl-net off the Cornish coast; and I have no reason to doubt the possibility of its being a British shell, any more than the *Triton cutaceus* and *nodiferus*, which (as will be presently seen) are now satisfactorily proved to be inhabitants of our southern coast.

Næra costellata, i. 199. Shetlands (*Mr. Barlee*).

Thracia villosiuscula, i. 224. Guernsey.

T. convexa, i. 29. Part of a valve in dredged sand from Skye.

Solecurtus candidus, i. 263. Herm and Guernsey, in sand, at half-tide mark (*Dr. Lukis*).

Psammobia vespertina, i. 271. Guernsey (*Dr. Lukis & J. G. J.*).

P. Ferroensis, i. 274. Guernsey (*Dr. Lukis & J. G. J.*).

Diodonta fragilis, i. 284. Guernsey. Only part of a valve, but sufficiently characteristic for distinction.

Tapes decussata, i. 379. Guernsey (*Dr. Lukis*).

T. aurea, i. 392. Guernsey (*Dr. Lukis*).

Cytherea chione, i. 396. Guernsey; rare (*Dr. Lukis*).

Cyprina Islandica, i. 441. Guernsey (*Dr. Lukis*).

Circe minima, i. 446. Plymouth.

Astarte arctica, i. 464. The single valve, which was dredged by Mr. M'Andrew in the outer haaf-grounds, Zetland, and recorded in the 'British Mollusca,' is evidently fossil; and Mr. M'Andrew agrees with me as to this. The late Professor Macgillivray's specimen was taken with valves of *Pecten Islandicus*, and has also the same Tertiary origin. My specimen, which was presented to me by the late Dr. Fleming, from St. Andrew's Bay, is in the same condition; and there is no satisfactory evidence of this species having been found on our coasts in a fresh or recent state,

Cardium aculeatum, ii. 4. Guernsey (*Dr. Lukis*).

C. rusticum, ii. 11. Guernsey (*Dr. Lukis*).

C. punctatum, *Brocchi*, Foss. Subapenn. ii. 666. tav. xvi. f. 11; *Philippi*, Test. Sic. ii. 38. *C. nodosum* (Turton), B. M. ii. 22. This species is not uncommon at Guernsey, and individuals are sometimes found there of a beautiful pink colour. Mr. M'Andrew has taken a variety of it in Vigo Bay. The punctures in the interstices of the ribs are more apparent towards the beaks, and may be easily observed under a moderate magnifying power. *Philippi* has, in his second volume, separated it from *C. papillosum*, and pointed out, with his usual discrimination, the differences which exist between the two species. I had also erroneously considered them identical in my paper on Piedmontese Testacea. *Brocchi's* name, being prior in point of date, must therefore be restored.

C. papillosum, *Poli*, Test. Sic. t. 16. f. 2-4; *Phil.* i. 51. This beautiful and very distinct species was first discovered in Guernsey by *Dr. Lukis*, and I have since detected it in shell-sand dredged off St. Martin's Port. It seems to be tolerably diffused on this part of our coast, though as yet rare. The largest specimen found, and for which I am indebted to the kindness of *Dr. Lukis*, measures upwards of half an inch in length and breadth. The one figured in Pl. V. fig. 1 *a, b*, is smaller, but of a milk-white colour. Other specimens are mottled with the same rosy hue that distinguishes those obtained from the Mediterranean.

C. fasciatum, ii. 25. Guernsey (*Dr. Lukis* & *J. G. J.*)

Lucina divaricata, ii. 53. Besides the locality mentioned for this rare shell by Messrs. Forbes and Hanley, where I obtained by dredging two single valves, I found another valve many years ago in shell-sand dredged from the Cornish coast for manure.

L. flexuosa, ii. 54. Plymouth and Guernsey.

Clausina Croulinensis, *Jeffreys*, Ann. N. H. xx. 19. *Lucina ferruginosa*, var., B. M. ii. 62. If such a thing as a species exists in nature, there can be, I think, no question that this is distinct from *C. ferruginosa*, both as regards form and texture and dentition. Figures of it are given in Pl. V. fig. 2 *a-c*. Mr. Barlee has lately found it in the Shetlands, together with *C. ferruginosa*.

With great deference to Mr. Searles Wood's opinion, I cannot agree with him in considering his *Cryptodon ferruginosum* specifically identical with the *Lucina ferruginosa* of Forbes and Hanley. His specimens (which I have examined carefully and compared with ours) appear to differ essentially in form, as well as in the hinge and mode of dentition; and I should be inclined to place his species generically with *L. flexuosa* instead of with *Clausina*.

Diplodonta rotundata, ii. 66. Guernsey (*Dr. Lukis* & *J. G. J.*).

Montacuta ferruginosa, ii. 72. Guernsey (*Dr. Lukis*).

M. substriata, ii. 77. Guernsey (*Dr. Lukis*). A more solid and opaque variety, in which the radiating striæ or ribs are obliterated, has been taken by Mr. Barlee, at a depth of 110 fathoms, in the Shetlands.

M. ? Donacina, var. *cylindrica*, Wood's Crag. Moll. part ii. p. 131.

I found a single valve of this remarkable shell by dredging at Falmouth in 1839; and it is (as Mr. Wood says) impossible to mistake it for any other species, or even satisfactorily to allocate it generically. In form it somewhat resembles a miniature *Zetatia*.

Turtonia minuta, ii. 81. In dredged sand from Guernsey I found a shell which apparently belongs to this species or to a variety of it. It is, however, of an oblong rather than an oval form, is more than double the size of ordinary specimens, and has dark streaks of purplish brown radiating from the hinge to the margin. The teeth also are conspicuous, and appear to agree with Lovén's description of northern specimens. It may be specifically different from *T. minuta*; but more specimens will probably be discovered, so as to clear up the doubt.

Lepton nitidum, var. *convexum*, ii. 102 and iv. 255 (*Kellia nitida*). Plymouth and Guernsey.

L. squamosum, ii. 98. Guernsey (*Dr. Lukis & J. G. J.*).

L. Clarkiæ, iv. 255. Plymouth, Torbay, and Guernsey.

Cyclas caliculata, ii. 115. Guernsey (*Dr. Lukis*).

Pisidium pusillum, ii. 123. Guernsey and Jersey (*Dr. Lukis*).

M. Baudon, in a recent and elaborate essay on the French *Pisidia*, unites *P. cinereum* of Alder and *P. pulchellum* of Jenyns as varieties of *P. Casertanum* (*Cardium Casertanum* of Poli); and he doubts the specific distinction of *P. Recluzianum* (Bourguignat), which is stated to have been found at Belfast, and which M. Moquin-Tandon regards as a variety of *P. Henslowianum*.

Modiola phaseolina, ii. 186. Guernsey, rather common (*Dr. Lukis & J. G. J.*). Falmouth (*Mr. Webster*).

Crenella rhombea, ii. 208. Not uncommon in the coralline zone, Guernsey (*Dr. Lukis & J. G. J.*); Torbay (*Dr. Battersby & J. G. J.*).

Nucula radiata, ii. 220. Guernsey, with *N. nucleus* (*Dr. Lukis & J. G. J.*).

Pectunculus Glycimeris, ii. 245. A curious monstrosity has been taken by Mr. Barlee in the Shetlands. The hinge-plate is flattened, and wants every vestige of the usual cardinal teeth; but, as a substitute, it has a rather strong lamina on each side locking into corresponding grooves in the opposite valve. This peculiarity would, in the opinion of some systematists, warrant the formation of a new genus. The specimen, which is young, is also distorted in form.

Pecten furtivus, (*Lovén*) Ind. Moll. Scand. p. 31. *P. striatus*, var., ii. 284. I found a single valve of this unquestionably distinct species in dredged sand from Guernsey; and Mr. M'Andrew has also taken it on the coast of Spain. It is intermediate between *P. striatus* and *P. tigrinus*, having the form of the first and sculpture of the last. Southern specimens are much larger than those hitherto found in the North.

Acephala Palliobranchiata, or Brachiopoda.

Terebratella (*D'Orbigny*; Megerlea, *King*) *truncata*. *Terebratula truncata*, Lamarck, vi. 1. p. 247. *Anomia truncata*, Chemn. viii. t. 77. f. 701 a, b. *Orthis truncata*, Phil. ii. 69. Having examined Dr.

Turton's specimen in my cabinet, which he is said to have procured from Torbay, and which is referred to in the foot-note at p. 362. vol. ii. of the 'History of the British Mollusca,' I am enabled to state confidently that it belongs to the above species, and not to *Terebratula detruncata* or *decollata*, as therein supposed. M. Collard-Descherres records *Terebratula truncata* as having been taken on the coast of Finisterre (Journal de Conchyliologie, tome ii. p. 393), and there is no reason to doubt the possibility of its being a British species. It is not uncommon in the Mediterranean. Chemnitz cites the *Anomia truncata* of Müller's Prodrömus to the 'Zoologia Danica' as a synonym, but I think hastily; for Müller separates, characteristically as well as generically, *Terebratula* from *Anomia*, and his diagnosis of *Anomia truncata* ("testa suborbiculata, obsolete striata, cardine truncato") may equally apply to a variety of *A. patelliformis*.

Argiope decollata. *Anomia decollata*, Chemn. viii. t. 78. f. 705. *A. detruncata*, Gmelin, 2347. *Orthis* (changed from *Terebratula*) *detruncata*, Phil. ii. 69. Of this fine and interesting species I found a few perfect specimens, of different ages, and two single valves in dredged stuff from Guernsey. The size of my largest specimen is nearly one-third of an inch square. These have not the normal form of the species, and resemble a horse's hoof in shape, being longitudinally oval, instead of transversely oblong (as in Mediterranean examples); and the ribs are much fainter and do not extend to the front margin. Specimens in Mr. M'Andrew's collection from Madeira (though smaller than ours) have the same form and sculpture. These may therefore belong to a distinct and undescribed species. A representation will be found at Pl. V. fig. 3 a-e. The specific name of *decollata*, given by Chemnitz, has priority over that of *detruncata*, which Philippi adopted from Gmelin, the latter author having erroneously cited Chemnitz as the authority for his name. The species was first indicated by Gualtier; but he did not designate it by any specific name, although his description is not bad compared with his drawing, which is abominable.

A. cistellula, ii. 361 (*Megathyris*) and iv. 257. Not uncommon in the coralline zone at Guernsey, Dr. Lukis having taken upwards of 200 specimens from a single stone. I erroneously referred this species in my paper on Piedmontese Testacea to the *Orthis Neapolitana* (*seminulum*, olim) of Philippi; but having since had the opportunity of examining a great number of specimens, I am satisfied that the two species are distinct. The *Orthis Neapolitana* differs from our species in being longitudinally instead of transversely oval (although individuals vary considerably in this respect), in the foramen being smaller, and in the hinge-plate being contracted, and not (as in *A. cistellula*) extending the whole breadth of the shell; in the papillæ which encircle the interior margin of each valve being much less numerous and more prominent; as well as in the internal rib of the under or flat valve being strongly serrated. It also attains to twice the size of *A. cistellula*. I have little doubt that Philippi's species will be found in the Channel Isles or on the south coast of England. Mr. Davidson (in his excellent monograph on

the British Tertiary Brachiopoda, p. 10) seems to question its being an *Argiope*.

A very minute Brachiopodous shell ($\frac{1}{25}$ th of an inch in length, and $\frac{1}{40}$ th in breadth) has been found by Mr. Norman in shell-sand from Plymouth, which he received from Mr. Webster; and it is so peculiar in form as to deserve special notice. It is egg-shaped and slightly compressed towards the sides and front margin, and is sub-opake and rather solid for its size. Foramen rather small. Auricles or lateral prolongations indistinct. The surface is closely punctured and quasi-tuberculated as in *A. cistellula*. It is of a horn-colour. Being so excessively small as to defy any attempt to examine the internal structure without danger of breaking or injuring the specimen, it is impossible to say whether it is an *Argiope*; but having carefully compared it with analogous examples of *A. cistellula*, which, as I before mentioned, vary greatly in form, I am inclined at present to consider it an extreme variety of that species. Nearly a similar variation of form, dependent on growth, occurs in specimens of *A. decollata*. The discovery of more and adult examples will probably clear up the doubt. By the kind permission of Mr. Norman and the assistance of my friend Mr. Alder (who concurs with me in the allocation of this specimen), I have given a representation of it at fig. 4 *a, b*, in the plate attached to this paper.

Pteropoda.

Spirialis Flemingii, ii. 384. Guernsey (*Edgar Macculloch, Esq.*), and in trawl-refuse from Plymouth.

S. Jeffreysii, ii. 386. The true locality for this species as British is Tenby; that given by Forbes and Hanley ("shores of the British Channel") not being quite correct. The mistake is probably owing to a misprint of the word "British" for "Bristol."

Gasteropoda Prosobranchiata.

Patella vulgata, ii. 421. The shell, in its very young state, has an excentric spire, which afterwards becomes absorbed, as in *Acmæa* and other genera. The importance of embryology in determining the laws of growth and classification is now fully admitted. With respect to the habits of the animal, Dr. Lukis informs me that in taking up the common Limpet, while in the act of crawling, he has noticed young ones attached to the grooves of the foot or sustentaculum; and he infers that the parent carries its offspring about with it for protection. I had heard of an oyster being "crossed in love," but I was not prepared for this wonderful instance of molluscan *σπορυγή*.

Trochus millegranus, ii. 502, var. *conica*. Guernsey and Plymouth.

Margarita (Trochus) pusilla, ii. 584. Guernsey. Mr. M'Andrew has taken it in the Mediterranean.

M. exilis. *Trochus exilis*, Phil. ii. 156. t. xxv. f. 15. *Skenea Cutleriana*, iii. 164, and (*Trochus*) iv. 270. In dredged sand from

Skye and Guernsey, and Mr. M'Andrew has it from the Mediterranean. A specimen, larger than usual, confirms the idea I entertained from the first, that this is Philippi's species.

Paludina vivipara, iii. 11. A young specimen occurred to me in the Guernsey dredgings; but how it got there is a marvel. Dr. Lukis assures me that there is no river in any of the Channel Isles, nor indeed any piece of water in which such a shell is likely to exist; and he has never found a *Paludina*, after many a diligent search for freshwater shells in that district. The specimen above mentioned may possibly have been transported by some river from the opposite coast either of England or France; the specific gravity of fresh water being less than that of the sea, its motion might buoy up such trifling substances for a long distance.

[In a letter which I have received from Dr. Lukis since writing the above, he offers a more probable solution of the problem, in suggesting that the shell may have been brought in ballast; and he says that some years ago, certain individuals, who were more adventurous and speculating than wise, opened a vein of black oxide of manganese in the neighbourhood of the dredging-ground, conceiving it to be a vein of plumbago, and that vessels came, no doubt in ballast, to remove the supposed treasure, and possibly left the shell in question to puzzle future *speculators*. I may remark, in confirmation of this idea, that I found, with the *Paludina*, some *Foraminifera* (species of *Rotalina* and *Nummulina*) which are evidently fossil, and may have been also brought from Sheppey or the Isle of Wight.]

Lacuna crassior, iii. 67. In dredged sand from Guernsey.

Rissoa Beanii, iii. 84. With the last.

R. cimicoides, *Forbes*, *Ægean Invertebrata* in Brit. Assoc. Rep. for 1843, p. 189. *R. sculpta*, B. M. iii. 88 (not of Philippi). Guernsey, with *R. calathus*. A comparison of typical specimens of *R. cimicoides*, in Mr. M'Andrew's collection, with our shells and the author's description, induces me without any hesitation to refer the *R. sculpta* of the authors of the 'British Mollusca' (founded on my specimens) to the above species. Philippi's species is evidently different, the longitudinal ribs and cancellation being more remote, and the inner lip smooth, in his shell. On this last character he indeed lays particular stress in comparing it with other species; and it is very distinct in our shell.

R. punctura, iii. 89. Guernsey (*Dr. Lukis & J. G. J.*).

R. rufilabrum, iii. 106. In dredged sand from Guernsey.

R. inconspicua, iii. 113. With the last.

R. vitrea, iii. 125. Torbay and Plymouth.

R. proxima, iii. 127. With the last; thus affording a corroborative proof that the two species are distinct.

R. pulcherrima, iii. 129. Paignton, at the rocks of *Corallina officinalis*. This cannot easily be mistaken for any of the numerous varieties of *R. inconspicua* (which is also found in the same locality), being so very different in form and markings.

R. soluta, iii. 131. In dredged sand from Guernsey, not uncommon; and in trawl-refuse from Plymouth.

R. Alderi, n. s. Pl. V. fig. 5 *a-c*.

Testa ovato-conica, solidula, nitida, lutea, strigis transversis creberrimis subflexuosis exilibus insculpta; anfractibus 5, convexis, sensim inerescentibus; sutura profunda; apertura subrotunda, superne acutangulata; labio fere continuo, columellæ adnato; umbilico parvo, angusto; long. $\frac{1}{12}$, lat. $\frac{1}{20}$ unc.

Only three specimens have occurred to me, in dredged sand from Skye, which was procured by Angus M'Nab, and in which I also found the two species of *Proteonina* described and figured by Prof. Williamson of Manchester in his elaborate and valuable monograph on the British Foraminifera. *R. Alderi* differs from *R. soluta* of the British Mollusca (with which it was found) in being more than twice the size, in the conical form of the spire, and in the peristome not being continuous.

R. ventrosa, var. *muriatica*, iii. 140. Guernsey, in abundance on *Uva lactuca* (Mr. Lukis, sen.).

Jeffreysia diaphana, iii. 152. Paignton.

J. opalina, iii. 158. With the last.

Skenea nitidissima, iii. 158. With the last two.

Aporrhais pes-carbonis, iii. 186. Mr. Barlee says that the animal of this species differs from that of *A. pes-pelecani* (both of which he has examined and compared together) in the following particulars. The entire snout and tentacula of *A. pes-pelecani* are of a dull brick-colour, while the snout of *A. pes-carbonis* is bright scarlet, with a snow-white opaque line running all down the centre, and terminating thus |,—the tentacula being of the same colour as the rest of the animal (viz. watery-white), with an opaque snow-white line down the centre to the very tip of each. The snout of this last species is also flatter and narrower than that of *A. pes-pelecani*; and its foot is long, narrow, and almost pointed when extended on the march.

Cerithium reticulatum, iii. 192. var. *sine varicibus et spira brevior*. From deep water, Guernsey; the ordinary form being littoral.

Cerithium Metaxa. *Murex Metaxa*, Delle Chiaje, Mem. (1823) vol. iii. p. 222. t. 49. f. 29–31. *Cer. Metaxa* (?), Wood's Crag Moll. part 1. p. 71. *Cer. angustissimum*, Forbes, Rep. on Æg. Inv. 190. Specimens, though rare, and in a more or less imperfect state, have been found at Guernsey by Mr. Norman, Mr. Barlee, and myself. Mr. M'Andrew has taken it by dredging off Teneriffe, and Pantellaria in Sicily; and I also obtained it by the same mode in the Gulf of Spezia. Having examined Mr. Searles Wood's specimens of what he doubtfully considered Delle Chiaje's species, I am satisfied as to the specific identity of the fossil and recent shells. Delle Chiaje notices the *four* transverse ribs, which is one of the characteristics of this species. It is the *Cerithium creperum* of Mr. Wood's earlier Catalogue of Tertiary Fossils. The accompanying representation (Pl. V. fig. 6 *a, b*) is taken from a Piedmontese specimen, which is much more perfect than any other that I have seen.

Scalaria Turtonis, iii. 204. Guernsey (*Dr. Lukis*).

S. communis, iii. 206. In dredged sand from Guernsey.

Aclis ascaris, iii. 219. Guernsey (*Dr. Lukis & J. G. J.*). Plymouth.

A. supranitida, iii. 220. With the last. Guernsey specimens vary as to the number and disposition of the transverse striae, which are sometimes wanting altogether, and at others are only present on the upper whorls, although their total or partial absence has evidently not been caused by friction.

A. (?) unica, iii. 222. Guernsey (*Dr. Lukis & Mr. Barlee*).

Stylifer Turtoni, iii. 226. I found a specimen, with the (dead) animal in it, among some trawl-refuse from Plymouth, which contained some of the *Echinus sphaera*; and I am informed that several specimens have been taken in the same locality.

Eulima stenostoma, n. s. Pl. V. fig. 7 *a, b*. *E. subulata*, var. ? iii. 236.

Testa acuminata, hyalina, alba, fragilissima, glabra; anfractibus 9, teretibus, gradatim increscentibus, ultimo reliquos æquante, superioribus duobus obtusis, fascia pellucida ultimum prope medium, superiores juxta suturam, cingente; sutura vix distincta; apertura pyriformi, contracta, subtus effusa, superne acutangulata; peristomate in columellam subreflexo; columella arcuata; long. $\frac{1}{2}$, lat. $\frac{1}{2}$ unc.

Mr. M'Andrew having obligingly presented me with one of his Zetland specimens, I am enabled to offer the above description. He has also taken specimens on the coast of Norway, which confirm the idea of this proving to be a distinct species, as was surmised by the authors of the '*British Mollusca*.' It has somewhat the appearance of a large *Achatina acicula*.

Chemnitzia simillima. *Turbo simillimus*, Mont. Test. Brit. Suppl. p. 136, and Laskey, Mem. Wern. Soc. 406. t. viii. f. 15. *Ch. pusilla*, Phil. ii. 224. t. xxviii. f. 21. *Odostomia lactea* β , Jeffr. Ann. N. H. vol. ii. n. s. p. 348. *Ch. elegantissima*, var., B. M. iii. 243. Torbay and Guernsey. Specimens from the last-named locality are sometimes toothed, as in *Odostomia* proper. It is very distinct conchologically from any of the varieties of *C. elegantissima*, and also malacologically, as Mr. Clark has observed. Montagu's description of *Turbo simillimus*, that it resembles *elegantissimus*, but is less slender, and has fewer and more distant ribs, that are not slanting or oblique, but straight and more arched, as well as larger than the interstices, seems exactly to distinguish the two species.

C. rufa, iii. 247 and iv. 276. Plymouth.

C. indistincta, iii. 255. In dredged sand from Guernsey.

C. clathrata, iii. 258. Mr. M'Andrew obtained a single specimen at Orotava. It has a closer affinity to *Odostomia interstincta* than to *O. indistincta*, but is evidently distinct from any of the varieties of either of those species.

Odostomia conoidea, iii. 260. Plymouth.

O. conspicua, iii. 263. I found a couple of fresh specimens in dredged sand from Guernsey; and Mr. Barlee procured another from the same source. It is by far the largest of our *Odostomiæ*.

O. acuta, iii. 269. Mr. M'Andrew has taken this species in Norway with *O. insculpta*.

O. plicata, iii. 271. Guernsey.

O. Eulimoides, iii. 273. A comparison of fresh specimens just received from Mr. Barlee, of what I considered at first a distinct species, and named *O. notata*, has satisfied me that the latter is only a variety of this Protean species.

O. dubia, iii. 276. Guernsey.

O. alba, iii. 278, var. *gracilior et scalariformis*. Guernsey, Skye, and Zetland (Mr. Barlee & J. G. J.).

O. cylindrica, iii. 287. Torbay.

O. insculpta, iii. 289. Guernsey.

O. Warreni, iii. 292. With the last.

O. truncatula, iii. 294. Adult specimens have a prominent and sharp tooth on the columella; but it is scarcely visible from the outside of the aperture.

O. decussata, iii. 303. With the last.

Eulimella Scillæ, iii. 309. Torbay (Dr. Battersby).

E. acicula, iii. 311. Guernsey (Dr. Lukis & J. G. J.).

E. affinis, iii. 313. Torbay (Dr. Battersby). Mr. M'Andrew has taken it in Norway with *E. acicula*.

Otina otis, iii. 321. var. *alba*. Guernsey (Dr. Lukis). Dr. Gray has very properly placed this genus in the family of *Auriculadæ*, to which it has conchological as well as malacological relations.

Cerithiopsis tubercularis, iii. 365, (*tuberculare*) var. *alba*. Plymouth (Mr. Barlee).

C. Clarkii, iii. 368. Another (being the second) specimen of this remarkable shell has occurred to me in dredged sand from Guernsey with *C. tubercularis*, which is not uncommon there; and it confirms the suggestion of the authors of the 'British Mollusca,' that it might prove to be a distinct species. Besides having only two rows of tubercles, the volutions are scalariform, and the suture is much deeper than in *C. tubercularis*.

C. pulchella, n. s. Pl. V. fig. 8 a-c.

Testa cylindrica, solidula, rufescente, costis longitudinalibus 18-20, transversis 4, cancellata, quarum 2 mediæ longinque prominent et infima carinam simulat, ad juncturam tuberculos efformantibus; anfractibus 7, convexis, ultimo reliquos subæquante; sutura profunda; apertura ovata; canali brevissimo; operculo membranaceo; long. $\frac{1}{10}$, lat. $\frac{1}{25}$ unc.

Falmouth, Plymouth, and Guernsey; but rare. Although the *C. tubercularis* is very variable in size, this species has a peculiar aspect, which is unmistakeable for that of any variety of the last-named species. Specimens of that species, of the same size as *C. pulchella*, have no less than twelve volutions; and the cancellations are invariably closer, and the transverse rows of tubercles equally prominent.

Murex rudis. *Fusus rudis*, Phil. ii. 180. t. xxv. f. 30. A single

specimen of this very distinct species has been in my cabinet for the last twenty years, and was found at Tenby by my late friend, Mrs. Richard Smith. Mr. Hanley considered it to be the young of *Fusus rostratus*; but, as Philippi justly remarks, his *F. rudis* differs from that species in its much less slender form and far shorter spire. Its nearest congener is *Murex corallinus*.

Buccinum Humphreysianum, iii. 410. Mr. Barlee says that the tentacula of the animal, instead of being flat and long (as in *B. undatum*), are peculiarly round and obtuse.

Fusus, iii. 433. pl. ciii. f. 4, 5. The fragment of a *Fusus*, described and figured as above, and which I examined in the cabinet of Mr. M'Andrew, clearly belongs to the variety *carinatus* of *F. antiquus*; and Mr. M'Andrew is of the same opinion.

Trophon scalariformis. *Fusus scalariformis*, Gould, Inv. Mass. p. 288. f. 203. *Trophon clathratus*, var.?, B. M. iii. 438 (foot-note). The large fragment mentioned by Forbes and Hanley (and which was presented to me by the late Professor Macgillivray) has every appearance of being recent, and it still contains the remains of a hermit-crab. In dredged sand from Belfast Bay I found a perfect, though younger specimen, with *T. clathratus*, which is common there. The two species are, I think, distinct.

Triton cutaceus, iii. 446. Dr. Turton's collection, as well as the British Museum, contains specimens (though in the latter they are in a worn and imperfect state) from Padstow and Guernsey; and Mr. Lukis, sen. and Mr. Macculloch have found several from time to time in the Channel Isles. But all doubt of the indigenoussness of this species may, I think, be considered as set at rest by mentioning that Dr. Lukis and Mr. Barlee dredged, last autumn, off the Guernsey coast, a half-grown and *living* individual. This I have seen, with the operculum preserved; and I am quite satisfied (as a lawyer!) with the proof of its being a British shell. I noticed specimens in the collection of M. d'Orbigny (père) at La Rochelle, in 1830, from the Gulf of Gascony; and it is rather a common Mediterranean species.

T. nodiferus. *T. nodiferum*, Lam. vii. 179. Three specimens of this truly magnificent shell have been taken in the Channel Isles at intervals, from 1825 to 1847; and two of them are now in the celebrated collection of Guernsey shells formed by Mr. Lukis, sen. I give in his own words the following account of these captures:—

"Three specimens have been dredged off the shores of Guernsey. In the year 1825, August 25th, the largest was brought to me by one of our island fishermen, named Charles Ozanne, of Paradis, in the Vale parish. He had a few days previously dredged it alive, and, in order to extract the fish, had boiled the shell. Some years after, a second was dredged by another fisherman, and was also alive. This was obtained in a living state by the late Admiral Sir Thomas Mansell. In the year 1847, a third specimen was brought to me alive, and I kept it in sea-water for a fortnight. It was very active, and repeatedly was found to have crawled out of the bucket on the floor."

The largest specimen now measures nearly 9 inches in length,

although the tip has been broken since it was taken. This specimen is partly incrustated with *Lepralia coccinea*, which, besides the northern habitat, first recorded by Müller in his 'Zoologia Danica,' is only found, according to Busk, on the coasts of Great Britain and Ireland. Through the kindness of Mr. Lukis, I have examined all the three specimens; and he has since most obligingly presented me with one of them. Mr. Hanley, to whom I lately mentioned this discovery, thought that the fisherman whom he had employed in dredging (Jean Tussaud) might have palmed the shells as native on Mr. Lukis, and that the specimens came from the coast of Spain; but this appears to be a mistake. There is therefore, I think, no reasonable doubt as to the admission of this interesting species into the list of British Mollusca. It has been found by M. Martin on the coast of Provence, and is not uncommon in the Mediterranean.

Mangelia purpurea, var. *Philberti*, iii. 460. In dredged sand from Guernsey.

M. cancellata. *Fusus cancellatus*, J. Sowerby, Min. Conch. t. 525. f. 2. *Clavatula cancellata*, Wood's Crag. Moll. part 1. p. 61. pl. 7. f. 9. *Fusus asperrimus*, Brown, Ill. Br. Conch. p. 8. pl. vi. f. 2. *M. purpurea*, var., B. M. iii. 467. With the last. This beautiful species is quite distinct from any of the varieties of *M. purpurea*, and approaches nearer in the mode of cancellation to the *Pleurotoma reticulatum* of Bronn and Philippi. One of Mr. Barlee's specimens from the Shetlands measures $\frac{5}{8}$ ths of an inch in length. The fossil shells are specifically identical with ours.

M. scabra. *Pleurotoma scabrum*, Jeffr. in Ann. N. H. vol. xix. p. 311. *M. linearis*, var., B. M. iii. 470. Guernsey and Plymouth, with *M. linearis*, which is certainly a different species. Mr. M'Andrew has taken both in the Mediterranean and Norway. I have added a representation of *M. scabra* at Pl. V. fig. 9 a-c. What Forbes and Hanley called the "purple-tipped" variety is this species in a worn and scarcely distinguishable state.

Gasteropoda Opisthobranchiata.

Ovula patula, iii. 498. Guernsey (*Dr. Lukis & J. G. J.*). Mr. Horace Marryat informs me that he took several of these beautiful creatures alive, at a very low tide, off Alcyonia and Sponges from the roof of the famous Gouliot cave in Sark,—the absence of light probably compensating for depth of water, as this species usually inhabits the coralline zone.

Amphisphyræ hyalina, iii. 521. Guernsey (*Dr. Lukis & J. G. J.*).

Bulla dilatata. *Haminæa dilatata*, Leach, Brit. Moll. p. 43. I have a specimen of this very distinct species from the collection of Mr. J. D. Humphreys mixed with *B. hydatidis* in a tray labelled "Cork Harbour;" and I found a couple of specimens in 1830 on the Ile de Rhè in the Gulf of Gascony. Mr. M'Andrew has also taken it off the Grand Canary.

Scaphander lignarius, iii. 536, var. *alba*. Guernsey (*Dr. Lukis*).

Philine punctata, iii. 547. In dredged sand from Guernsey.

Gasteropoda Pulmonifera.

Helix aperta, iv. 43. Dr. Lukis thinks the specimen recorded as having been found in Guernsey by the late Professor Forbes was accidentally imported; and he adds that he has searched for the species in vain. It is rather a common article of food in the south of France and in Italy, and makes a dainty dish for snail-eaters.

H. aspersa, iv. 441. Mr. Barlee states, in answer to my inquiry as to the existence of this species in the Shetlands, that he has not been able to find it there. This common pest of our gardens does not appear to be known in the north of Europe or in Germany.

H. Pisana, iv. 561. On the western and southern shores of Jersey (*Dr. Lukis*).

H. ericetorum, iv. 61. Dr. Lukis says this species has been taken in Jersey, but is not now to be found there.

H. globularis, *Jeffr.* Linn. Trans. vol. xvi. p. 507. *H. sericea*, B.M. iv. 71 (not of *Draparnaud*). Guernsey (*Dr. Lukis*).

H. umbilicata, iv. 81. I found a specimen in trawled stuff from Plymouth, which had been taken at a distance of several miles from the shore.

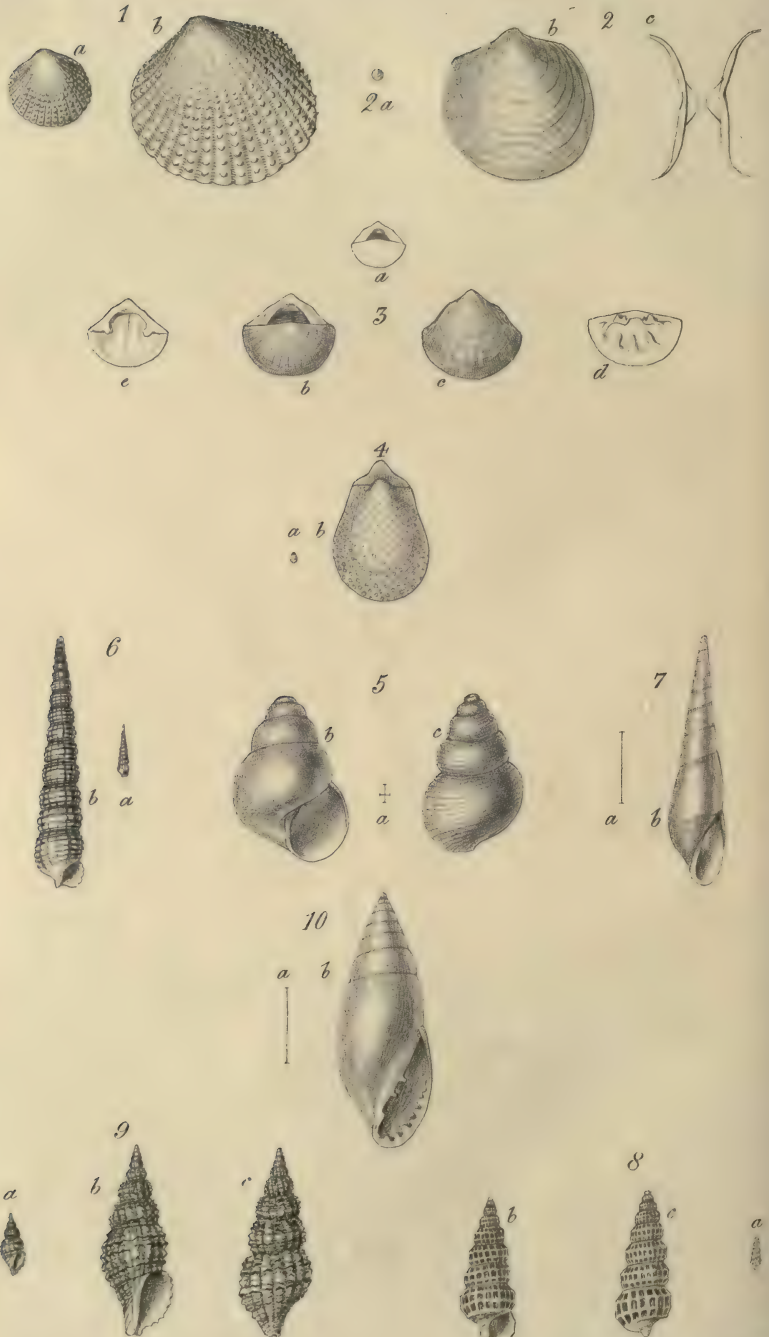
Pupa alpestris. *Vertigo alpestris*, Alder, Trans. Nat. Hist. Soc. North. vol. ii. p. 340. *Pupa Shuttleworthiana*, Charpentier in Zeitschr. für Malak. for 1847, p. 148. *P. pygmæa*, var., B.M. iv. 106. Mr. Norman informs me that this species has been lately taken, rather abundantly, by Miss Sarah Bolton in the neighbourhood of Ambleside, on slate; and he adds that the recent notices of its rediscovery in the south of England and the neighbourhood of Dublin (as respectively recorded in the 'Zoologist' for 1850, vol. viii. p. 2743, and the Nat. Hist. Rev. vol. i. p. 94) are erroneous,—Mr. Bridgman's specimens from Norwich (judging from one which is in the British Museum, labelled "*Vertigo alpestris*") belonging to *P. pygmæa* (which I can confirm), and an example of the Dublin shell sent to Mr. Norman by Mr. Hogan as "*Pupa alpestris*," being quite a different species. I found specimens of *P. alpestris* at Zermatt and in the valley of the Dranse, in 1855, and they were named by the late M. Charpentier "*Pupa Shuttleworthiana*." Mr. Alder's name has, however, the precedence of publication. Specimens which I have received from Mr. Norman agree with those I found in Switzerland, as well as with the description of Mr. Alder, who has recognized them as his species. It is unquestionably distinct from *P. pygmæa* or any of its varieties.

Planorbis lacustris, iv. 162. Guernsey (*Dr. Lukis*).

Limneus acutus, *Jeffr.* Linn. Trans. xvi. 373. *L. auricularius*, var., B.M. iv. 170. Neighbourhood of Oban (*Capt. Bedford*); Bloomfield, Kent. Although all the species of *Limneus* are especially subject to variation of form, I much doubt if this is not distinct from *L. auricularius*. It is certainly not an "immature variety" of the last-named species, as stated by Forbes and Hanley, for I have found specimens of all ages agreeing in a common character.

L. glaber, iv. 178. Guernsey (*Dr. Lukis*).





Ancylus oblongus, iv. 188. Guernsey (*Dr. Lukis*).

Conovulus denticulatus, var. *reflexa* (*Turton*), iv. 194. *Carychium personatum*, Michaud, Suppl. to Drap. p. 73. Guernsey (*Dr. Lukis*). In crevices of rocks above high-water mark, Goldingham Bay, near Paignton. The colour of the animal is yellowish white, and that of the tentacula light grey. Each whorl in young individuals is encircled with a coronet of spines or bristles, as in the typical form. A representation of this well-marked variety is given at Pl. V. fig. 10 *a*, *b*.

Cyclostoma elegans, iv. 201. Dr. Lukis informs me that this species is found in Alderney, but not in Guernsey.

1, Montagu Square, London,
July 1858.

EXPLANATION OF PLATE V.

- Fig. 1. *Cardium papillosum*, var. : *a*, natural size ; *b*, magnified.
Fig. 2. *Clausina Croulinensis* : *a*, natural size ; *b*, magnified ; *c*, hinge, magnified.
Fig. 3. *Argiope decollata*, var. : *a*, natural size ; *b*, front view, magnified ; *c*, back view, magnified ; *d*, interior of lower valve ; *e*, interior of upper valve.
Fig. 4. *A. cistellula*, var. ? : *a*, natural size ; *b*, magnified.
Fig. 5. *Rissoa Alderi* : *a*, natural size ; *b*, front view, magnified ; *c*, back view, magnified.
Fig. 6. *Cerithium Metaxa* : *a*, natural size ; *b*, magnified.
Fig. 7. *Eulima stenostoma* : *a*, natural size ; *b*, magnified.
Fig. 8. *Cerithiopsis pulchella* : *a*, natural size ; *b*, front view, magnified ; *c*, back view, magnified.
Fig. 9. *Mangelia scabra* : *a*, natural size ; *b*, front view, magnified ; *c*, back view, magnified.
Fig. 10. *Conovulus denticulatus*, var. *reflexa* : *a*, natural size ; *b*, magnified.

XV.—*Observations on Conchological Nomenclature.*

By M. O. A. L. MOREH.

IN the 'Annals of Natural History' for January 1857, there appeared a review of the 'Genera of Recent Mollusca,' by Messrs. H. and A. Adams, which has only very recently come under my notice, and which appears to me to call for a few observations, both on the general principles adopted by the reviewer, and on the individual errors indicated in the review.

The state of conchology has in many respects been for a long time far behind that of most other departments of Biology. The genera of the Testacea of Linnæus scarcely correspond in value to the Orders in his classification of the higher animals ; and the genera established by Lamarck, now commonly in use, hardly possess the rank that should be given to families. The want of a better systematic arrangement in this branch of natural history has for a considerable period been felt by many naturalists ;

and numerous attempts at a better classification (chiefly monographic) have been made by writers of different countries, which, however, have been neglected by the great majority of conchologists, who prefer following in the path of an antiquated celebrity to availing themselves of modern research and independent investigation. Gray, Agassiz, and Herrmannsen were the first who directed attention to the subject generally; and to Swainson and Gray we are indebted for the earliest attempts at forming more reasonable divisions of the genera.

The 'Genera' of Messrs. Adams must be regarded as a great advance in the same direction by all who have specially devoted themselves to the study of Mollusca, although their work may not prove the most useful to be consulted by pupils and students of Conchology. By the united critical labours of different conchologists it will perhaps be possible, at no very distant period, to produce a work that shall be more complete. Before, however, a standard nomenclature can be obtained, the fundamental principles of nomenclature must be settled. The errors of Linnæus we must believe would have been corrected by the immortal founder of the existing school of naturalists himself, had he been acquainted with the present development and state of Biology. It appears strange in the present day to find it deliberately maintained, as in the review in question, that genera have no foundation in nature, but are purely artificial, and only "useful in a few great collections," or "convenient in special or elaborate monographs," and that "for ordinary purposes a much smaller number of divisions is sufficient." It seems not less strange to find the reviewer expressing wonder at the number of genera contained in the work, which must be regarded as small in comparison with those in entomology or ornithology, or even possibly with what may be found to exist when the Mollusca now known are more closely examined. Such considerations as the number of genera, and the ability to retain their names in the memory, are foreign to real science, and can only find a place in treatises of a popular character.

Some names, it is objected, "are taken from works published before the time of Linnæus." The claim to be the first to establish genera was never made by Linnæus, neither did he request his successors to ignore the works of his predecessors, which would have been contrary to the practice he himself pursued. "*Nomina generica, quamdiu synonyma digna in promptu sunt, nova non effingenda*.*." "*Nomen genericum antiquum antiquo generi convenit*†."

Let us inquire what is meant by ante-Linnæan? The Com-

* Phil. Botan. 247. p. 190, and Fund. Botan. 1736.

† Linn. Fund. Botan.

mittee of the British Association has advanced the doctrine that no name older than the twelfth edition of the 'Systema Naturæ' can be recognized; but it is evident that Linnæus fully established his binomial nomenclature in the tenth edition,—a work which would have been sufficient for the introduction of that system even if the twelfth edition had never appeared. In 1756, species were for the first time distinguished by a word instead of a phrase. The specific names of Linnæus could not, however, have existed without genera to which they could be referred, "*uti campana sine pistillo*;" and generic divisions and names had in fact been in use long before. In 1735 appeared the first edition of the 'Systema Naturæ,' in which all organic nature was divided into Classes, Orders, and genera, in accordance with the laws published by the author in the following year, 1736, in his 'Fundamenta Botanica,' the soundness of which has since been generally acknowledged. The Linnæan æra commences therefore with that year, and not with the date of his last work, because it is the spirit of his system that we adopt, and not his nomenclature, which is now entirely changed. His method was immediately followed by several naturalists (Hill, Patrick Browne, Adanson, &c.) long before the twelfth edition of the 'Systema Naturæ' appeared. Ray and Willughby were the first who introduced good genera, as Linnæus himself acknowledges. In the works of these authors names were introduced, such as *Felis*, *Leo*, *Tigris*; but these names are not truly generic, but vernacular; and for that reason also the names of Aristotle, Pliny, Gesner, Buonanni, &c., cannot be adopted.

Again, it is objected that some genera "were never characterized." If a generic character is required as a *sine quâ non*, it is necessary that such a character should be a true one; but this character will always be changing according to the different views of authors at different periods. The generic character is a good guide, but not a necessity, for the professional zoologist, who must be able to judge among the specific characters which are of generic and which of specific value. The first process in establishing a genus is to select those species which possess characteristics not found in other genera; and from these, again, to choose the most characteristic as the type. No definition at all is better than one that is inaccurate. The genera *Ranella* and *Triton* are established upon the position of the varices of their shells; and although many species have since been discovered without any varices, the genera must nevertheless be considered as established. The genus *Cylindrella* now contains many species differing from the original definition.

What is the type of a genus?—The Committee of the British Association maintains that the species first mentioned must be

regarded as the type; and this view appears generally to be the most natural. Linnæus directs that, if a genus must be divided, the most common species shall preserve the old name. This course can scarcely, in the present day, be considered as very scientific. The author who establishes a genus alone has the right to decide which species he wishes to be regarded as the type, and to interpret the meaning of his generic name. In such authors as Klein and Hill, who illustrated their genera by figures, it is most natural to regard the species selected for illustration as the type. In Adanson, the species which bears the same name as the genus must be regarded as the type. It is thus erroneous for an author to consider *Fossar* to be the type of the genus *Natica*, because it is the first in order and the only one of which the animal is described. On the contrary, the second species, *la Natice*, must be regarded as the type. Thus of *Haliotis*, *l'Ormier* is the type; of *Yetus*, *Yet*; of *Porcellana*, *Porcellaine*; of *Cerithium*, *Cerite*; of *Vermetus*, *Vermet*. If no species is named in the genus, it is because none is found in Senegal.

What is required for a generic name?—Linnæus gives many rules for the correct application of names, but the only condition he imposes is that the name shall be a single word of Latinized form, and not composed of two distinct terms, as *Radix Bryoniæ*, *Solen anguinus*. Barbaric words are admitted as generic names, as *Coffea*, *Thea*, *Chara*, *Pothos*, *Jambolifera*; and why not also retain hybrid names, of which the Latin language itself affords many examples? It is then unnecessary to change *Cirroteuthis* to *Bostrychoteuthis* or *Sciadephorus*. Nearly all the genera adopted by Linnæus are in opposition to his own rules, as *Conus*, *Mactra*, *Venus*, *Trochus*, *Turbo*, *Arca*, *Buccinum*, *Patella*, &c., because Linnæus considered the historical right of a name to be of greater importance than the correctness of its formation,—not, however, in justice to the author, but to history, for Linnæus never added the author's name.

On the Genera of Klein.—Lang was the first (1722) who produced a systematic Manual of Conchology, divided into genera which approach nearly to those of Linnæus at present in use; but, unfortunately, most of his names were composed of two words, and cannot therefore be recognized by naturalists of the Linnæan school. Fischer of Königsberg, in 1732, published a revised system with an improved nomenclature; and a list of the names appeared in Klein's 'Echinodermata,' in 1733. The descriptions were first published by Klein in 1752, who must, however, be regarded only as the editor and commentator, as appears by the introduction. If we take into consideration that Klein's 'Tentamen Methodi Ostracologicæ' was published at the time when Linnæus divided all univalve shells into five

genera only, and all bivalves into one Class (Concha), we must regard Klein's as a classical work. Many of his genera were not inferior to those now in use; and those in which there exists the greatest intermixture of species are certainly not worse than the Linnæan, which are now generally adopted: for instance, *Bulla* of Linnæus includes *Ovula* and *Physa*; *Turbo* includes *Clausilia*; *Littorina*, *Turb. marmoreus*; and *Nautilus*, *Planorbis* and *Foraminifera*. In the republic of science all are equal, and have the same claims upon the justice of posterity. As conchologists, Klein and Fischer were perhaps superior to Linnæus, although in their nomenclature they were inferior to him; and with regard to Klein, we possess this advantage,—that in most cases there can be no doubt as to the type, of which a figure is always given. Shuttleworth, for instance, will not adopt the genus *Pseudotrochus* (a name as good as *Pseudachatina*, Albers) because, in addition to the figured type (*Bulla virginea*, Linn.), it includes *Cerithium telescopium*, although these forms do not differ more than the species in the genus *Helix*, Linn., adopted by the same author. The genus *Chersina*, Humphrey, is preferred to *Liguus*, Montfort, although the former is composed of the heterogeneous species, *Bulla virginea*, *Bulla achatina*, Linn., and a *Tornatella*. It must be a matter of indifference how much the species referred to a genus differ from the type, if they are not congeneric with it.

I will now offer a few observations on the assumed errors indicated by the reviewer.

Nerita, Klein, cannot be used, because Lister's name adopted by Linnæus, but more accurately defined than by the original author, has priority.

Garagoi, a name as good as *Muscari*, Tournef., or *Gari*, Schumacher, is a generic name borrowed from Buonanni, who used it as a vernacular name for Spaniard. It is very likely a misspelling of Caracol. I am not able to identify the figure; perhaps it is *Littorina ziczac*.

Cophinosalpinx (compounded from *κόφινος*, *corbis*, and *σάλπιγξ*, *tuba*) does not contain any *Pleurotoma*, but a *Mangelia*, several *Nassæ*, and *Phos senticosus*; but the type belongs to *Ricinula*!

Buccinum, Klein, is the name of a Class, and not of a genus. *Buccinum*, Browne, is *Triton*, Montfort.

Saccus, Klein, is *Turbo* of Cuvier, which contains many different species. The type selected for illustration is *Turbo marmoreus*.

Ficus, Klein (1752), Bolten, Humphrey, Rousseau, is pre-occupied by Linnæus for a plant. Gray has introduced Browne's name *Sycotypus*, but, I believe now, erroneously, because Browne mentions a hairy epidermis, which is not found in any species of that genus. Perhaps it may be a young *Triton*. It is also

strange that Browne has not quoted any figure of Lister, who gives several of this genus, of which only one species was known, from the West Indies. Lamarek's name *Pyrula* (1799 and 1801) must be retained for *Ficus* and *Ficula*, Swainson.

Argobuccinum is a name as good as *Pholadomya*, *Volutomitra*, &c. The type is *Ranella Argus*.

Auris, Klein, 1753, was already used by Linnæus in the first edition of the 'Systema Naturæ,' 1735.

Haliotis was first described by Lister, and named by him *Auris marina*.

Auris Midæ, Klein, is composed of two words, and therefore cannot be used.

Cavolina was established by Gioeni, 1783, in his 'Descriz. di una nuova famiglia, &c.,' and Ahildgaard re-described the genus in 1791, one year before Bruguière published the name *Cavolina*, without description, in the plates of the 'Enc. Méth.'

Clio, Browne (1756), was adopted by Linnæus, although he had never actually seen it. "Clionis genus mihi non visum e Cl. Brownio mutuatus sum." Linnæus has only added specific names to Browne's descriptions. Linnæus here affords an example of founding species upon figures and descriptions,—a practice for which Gmelin has been often censured. Browne mentions in his specific description "vagina triquetra," which proves clearly that he meant a *Cleodora*, of which a species is figured. The name given by Peron and Lesueur was therefore unnecessary, and cannot be acknowledged.

Cassidea, Brug. (1792), is a synonym of *Cassis*, and cannot be used for *Oniscia*, which is the sixteenth species in the list of twenty-one enumerated as belonging to that genus.

Cassidula, Humphrey (not *Cassidulus*), is distinct from *Cassidula*, Lam. (= *Echinanthus*, Breyn).

Bursa of Petiver and Buonanni is a vernacular name, and cannot be used generically.

Thais of Bolten is not a synonym of *Monoceros*, as the only species of the latter genus is the last in order among the eight species mentioned.

Cylindrus is only mentioned by Breyn as an example of monothalamous shells.

Operculatum, Linn. The binomial nomenclature was first employed by Linnæus in the 'Mus. Tessinianum,' 1753, where the shells are described in the same manner as in the tenth and twelfth editions of the 'Systema Naturæ':—

- | | | |
|----------------|----|---|
| lingulata..... | 1. | Pinna linguiformis subfalcata. |
| lacera | 2. | Arca striis membranaceis laceris. |
| læve | 3. | Operculatum, tab. vi. f. 5. Testa fere lapidea, orbiculata a latere, superne magis gibba, ab inferiore plana, punctis elevatis. <i>Ignoti generis</i> . |

It seems clear to me that Linnæus regarded it as a new genus like *Arca* and *Pinna*. None of the shells here described are mentioned in any of his later works.

Tectura, Aud. and M.-Edw., is named and described in the 'Compt. Rend.' for 1824. In the 'Hist. Nat. du littoral de la France,' it is characterized by the gills as a new genus, but not named.

I will conclude with a few bibliographical observations.

The name of the person who writes a work is a matter of perfect indifference to science, and is only necessary for the purpose of distinguishing the work. To the public, each work or edition is as it were a different person.

The 'Museum Boltenianum' was originally written by the possessor of the collection, a pupil of Linnæus, with additions and corrections by P. F. Röding and Dr. Schultze, as appears from the preface furnished by Ant. Aug. Hy. Lichtenstein. I. C. Fabricius mentions, in the 'Mem. of the Nat. Soc. of Copenhagen,' 1793, vol. iii. p. 153, that the most important work of Schultze was the arrangement of Bolten's collection, but which he would probably never be able to complete. Bolten's work was subsequently much used by Link, Lichtenstein in the Duplicate Catalogue, and Schumacher. The work, of which there are two editions, is far from rare.

Link's 'Verzeichniss' was burnt either by accident, as Herrmannsen (on the authority of Beck) states, or by the author; but a copy was preserved at the University of Rostock, which copy has been recently brought to light by the researches of conchologists. The author would not, according to Troschel, acknowledge his work; but no author has a right to repudiate that which has been once published.

Copenhagen, June 3, 1858.

BIBLIOGRAPHICAL NOTICE.

The Aquarian Naturalist : a Manual for the Sea-side. By THOMAS RYMER JONES, F.R.S. &c. London, Van Voorst, 1858, 12mo, pp. 524.

CONSIDERING the number of guides who have within the last few years endeavoured to lead our sea-side pleasure-seekers to find a purer and more intellectual enjoyment than that presented by the ordinary course of existence at watering-places, in the investigation of the wonders which Nature has lavished with a prodigal hand on every shore, it must be confessed that the apparent effect produced is very

small indeed. Books of all qualities and all prices,—from the beautiful but rather costly volumes of Gosse down to the little work in which the “Common Objects of the Sea-shore” are reduced to the level of the lowest capacity at the correspondingly low price of one shilling,—books, good, bad, and indifferent, meet one’s eye at every turn; and if all visitors to the sea-side do not acquire some knowledge of marine zoology, it certainly is not the fault of our natural-history writers. In fact, we are almost surfeited with works published with this object. Mr. Thackeray, when enjoying the hospitality of the amiable Ponto family, found that there was a sameness about a continued pork diet, and considered their beginning upon a sheep an incident worthy of record; and when we look back upon the numerous books that have appeared since 1850 on the Aquarium and kindred subjects, we are quite ready to sympathize with the illustrious snobographer.

Surely in this, if in any similar case, we might entertain a reasonable dread of the production of the effect proverbially attributed to the cooperation of too many cooks. Nevertheless there was one of the *chefs* of the natural-history *cuisine*, if we may be allowed to make use of such a term, a very Soyer in his line, who had not yet contributed any production of his art to the entertainment,—one whose scientific attainments and literary power render his popular writings the most attractive of any that have appeared in our language. His long-promised work on the Aquarium has at length made its appearance; and although it comes, let us hope, in the very last course of the aquarian banquet, it is so savoury in its nature, so delicately seasoned, and so admirably concocted, that, surfeited as we were already, we fall-to upon it with renewed relish, and devour its charming pages with avidity.

Indeed, considering the inspiration under which it was written, it would be astonishing were Professor Rymer Jones’s book otherwise than charming; he tells us in his preface, that in its composition he has endeavoured to comply, as far as possible, with the requisitions of his lady-friends, to whose very efficient protection he seems to confide it; sparkling eyes and fairy fingers appear to have been his constant assistants in his investigations of the wonders of the shore; and in his treatment of the subject we trace much of the brilliancy of the eyes and much of the delicacy of the fingers.

But independently of all charms of style, and of the accessories, such as descriptions of scenery and anecdotes, scattered here and there in its pages, the ‘Aquarian Naturalist’ is undoubtedly the best of all the sea-side books which have come under our notice. Commencing, as in duty bound, with directions to the intending “aquarist” upon the establishment and management of his vivaria,—directions which, although occupying only twenty-six pages of the work, contain all the necessary information,—Professor Rymer Jones proceeds to the consideration of the various forms of marine animals, with especial reference to those which may be conveniently introduced into the aquarium. Starting from the lowest animals,

the Sponges and Rhizopods, he works his way upwards through the different classes and orders, describing a few of the most striking species in each, in such a way as to furnish his readers not merely with a desultory sketch of a few animal forms, but with a very finished picture of the zoology of the sea. Thus we not only find in his pages striking and elegant descriptions of the various species of marine animals which are adapted for the purposes of the aquarist, but exceedingly graphic accounts of their habits, mode of life, and especially of their development; and what renders the work of particular value in this respect is the introduction of a feature which we have long thought to be a desideratum in books of the same nature, namely that in addition to information as to what is known upon the creatures referred to, the author has also furnished his readers with an indication of the point at which our present knowledge stops, and of the direction in which further observations should be pursued, so that the keeper of aquaria, who may have the opportunity of observing some animal the history of which is still imperfect, may learn at once from its pages to what to direct his attention.

Of the numerous passages which we had marked for extraction, our space will only allow us to furnish one or two. Here is a specimen of the mode in which our author elevates one of the commonest objects of the shore:—

“The naturalist who confines his attention to the larger and more conspicuous forms of marine productions, neglecting those which, from their minuteness, require the aid of a microscope for their examination, would be but little able to appreciate the scene exhibited upon the exterior of many ordinary shells, when, freshly imported from their home beneath the waves, they are perused attentively with a magnifying-glass. The wonderful variety of animal life that crowds every portion of the surface of some of them, affords a spectacle well calculated to astonish any observer who for the first time contemplates such a scene; and when, upon closer inspection, we perceive how actively employed they all appear, how all find room for life and for enjoyment on the little stage that forms their world, unknowing all beyond, as if creation was confined to them, a reflection by no means unnatural will sometimes steal across the mind, that we ourselves are imaged in their condition, and in their ignorance of what is passing in surrounding nature beyond the sphere of their immediate neighbourhood.

“Six thousand years have passed since man was placed upon this sublunary scene—ages untold have rolled away since these little zoophytes began to live, and toil, and die, and leave behind inscribed in every stone the record of their industry; and yet two centuries have not elapsed since man for the first time suspected their existence—since man first became aware that such things *are*, much less that such things had been, and had perished. Surely the sage was not far wrong who said, that science was a little boy employed in picking up pebbles upon the shore, as specimens of the vast wealth concealed beneath the limitless expanse of ocean.”

The interesting history of the discovery of the animality of Zoophytes is enlarged upon in a most lively and interesting manner at p. 135 :—

“Little more than a century has elapsed,” says Professor Rymer Jones, “since . . . zoophytes were considered the undoubted subjects of the vegetable kingdom. . . . The zoologist claimed none of them, if we except the *Actiniæ*, for his province and study, but left them, without dispute, to botanical writers ; and if any of these, in reference to a very few zoophytes of less arborescent character than the rest, hazarded a whispered conjecture that they were wrongly classed, it died away in the utterance, and raised no echo to awaken further inquiry.

“The only opposition to the botanical theory came from the mineralogists, who, some of them, questioned the vegetability of such of these productions as were of a hard and stony nature, contending that they were rather rocks or stones formed by the sediment or agglutination of a submarine general compost of calcareous and argillaceous materials, moulded into the figure of trees and mosses by the action of the waves, by crystallization, by the incrustation of real fuci, or by some imagined vegetative power in brute matter.

“It was only somewhere about the year 1730 that Peyssonnel, a physician residing at Marseilles, whose opportunities of observing these organisms entitled him to give an opinion upon the subject, first ventured to maintain, that what had previously been described as the ‘blossoms’ of the coral, were true animals (‘insects,’ he thought proper to call them), analogous to the *Actiniæ* or Sea-Anemones ; that the coral was secreted in a fluid form by the inhabitant *Actiniæ*, and became afterwards fixed, hard, and changed to stone ; and that all other stony plants, and even sponges, are the work of different ‘insects’ peculiar to each species of these marine productions, which labour uniformly according to their nature, and as the Supreme Being has ordered and determined.

“Jussieu, whose eyes had been opened to the real nature of the zoophytic races by the arguments of Peyssonnel, although, truth to say, he seems to have been convinced sorely against his will, at last declared his complete faith in the animality of these creatures, and his conviction that a numerous list of productions, hitherto unexamined, would be found to be of the same nature : in fact, he seems to have revelled in the enjoyment of the prospect thus revealed before him. ‘All that we have said,’ he thus concludes, ‘of the polyps of the sea is merely a sort of advertisement, which, however, cannot fail to produce the effect which we promise ourselves from it ; it will doubtless direct the curiosity of naturalists who reside by the sea to animals so worthy of being better known. They will seek out different species ; they will delight to describe to us the varieties presented in their forms, which are never but remarkable ; they will study the figure and disposition of the cells of various species, their manner of growth and reproduction, and wherewithal they are nourished ; they will place in a clear light everything that has reference to the different polypidoms and their formation, so that a department

of natural history so interesting, so new, and as yet only sketched in outline, may be rendered as perfect as it merits to be.' They will ;— but here we must fancy the enthusiastic old gentleman, in the exuberance of his delightful anticipations, flinging his hat and spectacles into the air ; and could he but have added, 'they will have aquaria wherein to keep them alive,' his well-powdered peruke would, as we may imagine, have speedily followed them in his frantic exultation."

Where all the descriptions are equally admirable, it is difficult to select any example of the descriptive powers displayed by our author ; but the following account of the appearance and manners of *Cydidippe pomiformis* will furnish the reader with a fair specimen of the style in which this department of the work is executed :—

"Amongst all the elegant forms of the Medusæ none can compete with the *Beroë (Cydidippe) pomiformis*, or emulate the wonderful machinery whereby it frolics in the glassy water. In the bright sunshine, on the level sand, just where the gentle ripples 'kiss the shore, then sleep in silence,' the observant eye may sometimes see a pearl—for such it looks to be—worthy of being a pendent to the one dissolved by Cleopatra,—but so frail, so delicate, so evanescent, that it must be taken up with tenderest care by those who would survey its beauties, and at once transferred into a vessel filled with its own element. Its body is then seen to be a little globe of clearest crystal, tinted with the hues of Iris, and, moreover, fringed from pole to pole with eight transparent bands of active cilia rapidly at work, by the aid of which it glides along, advancing like a meteor through the water.

"It is, however, when the Beroës have just been taken from the sea that they exhibit in the highest perfection their locomotive powers, and display in the bright sunshine the splendid iridescence of colouring caused by the action of their cilia to the greatest advantage. As they wheel onwards, rising and falling at pleasure, and creating in their course the glory by which they are encircled, they seem indeed

..... 'gay creatures of the element,
That in the colours of the rainbow live.'

"The variety of their evolutions constitutes one of their principal charms. Sometimes they will ascend from the bottom of the jar to the surface of the water with a slow and regular movement resembling that of a balloon, and descend at the same rate of progression. Again, they will rise more rapidly, and turning their mouth downwards, descend with equal rapidity. At other times, without rising or falling, they will revolve on the transverse axis of their body—then, abandoning all these modes of progression, they will revolve on their longitudinal axis, holding the body vertical, and in this position twirl round and round the glass like graceful waltzers. When the movements of the animal are thus varied, how great must be the variety of motion in the cilia by which the body is propelled ! Never for more than a second or two do the cilia cease to vibrate. Even then it is not a total suspension, but a slower and alternant action, that is exhibited ; the cilia on one or two contiguous bands remain

stationary, while the adjacent ones on either side are in motion—then those which have been still begin to play, and those that were previously moving remain still: no regular succession of procedure is observable; but some portion of the bands of cilia are kept constantly in action, all seeming to perform their duties quite irrespective of the rest.

“The tentacula of these beautiful animals are, next to their cilia, the most interesting portions of their structure. These organs are not always apparent, but remain enclosed in the creature’s body. They are seldom displayed immediately after the Beroës have been captured, nor when the glass vessel in which they are kept is too much crowded. When, however, not more than five or six are placed together, the tentacula may be seen developed to their fullest extent, frequently extending above six times the length of the body of the animal. The tentacula are often projected from their tubes to their full extent by one impulse, and the slow uncoiling of the slender serpentine filaments from their margin is then very beautiful. Indeed it is scarcely possible to convey by any description an idea of the elegance and diversity of their forms. They seem endowed with exquisite sensibility, which, however, is not always equally delicate. At times, the slightest touch will cause a tentaculum to be drawn back into its sheath with a sudden jerk; at other times it is apparently unfelt. The Beroës never seem to be poised or supported in the water by the assistance of these remarkable organs; but sometimes, when they are extended to the bottom of the vessel, they seem to act as suckers, and to form fixed points whence the animal rises and falls at pleasure, appearing as if moored by these delicate and novel cables.”

But our space warns us of the necessity of bringing this notice to a conclusion, which we do in the hope that the samples of the quality of Professor Rymer Jones’s work which we have here given, will induce our readers to gratify themselves by a perusal of the whole. We may add, that it is illustrated by eight plates, well executed in chromolithography by Mr. Tuffen West, and containing excellent representations of nearly all the objects referred to in the book.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

January 26, 1858.—P. L. Sclater, Esq., F.L.S., in the Chair.

ON NEW SPECIES OF BIRDS FROM THE RIO NAPO, IN THE REPUBLIC OF ECUADOR. BY PHILIP LUTLEY SCLATER, M.A., F.L.S. ETC.

ANABATES MELANOPEZUS.

Supra saturate umbrino-brunneus, uropygio rufescente, cauda pure rufa: subtus pallide cinerascanti-brunneus, medialiter

dilutior; gula albicantiore sed rufo lavata; crisso rufescente; tectricibus subalaribus cum remigum intus nigricantium parte vicina late rufis: rostro nigro, gonyde pallescente; pedibus nigricanti-plumbeis.

Long. tota 7·0, alæ 3·2, caudæ 3·0.

This species is very closely allied to Tschudi's *A. ochrolæmus*, with which it has been identified by M. de Lafresnaye. But as I have in my collection one of Tschudi's original specimens (of *A. ochrolæmus*), I am enabled to affirm that the two birds, though much resembling one another, cannot be considered as of the same species. Their upper surfaces are much alike; but beneath, the present bird is of a very pale ashy-brown, while *A. ochrolæmus* is nearly as dark below as above. In *A. melanopezus* the bill is shorter, stouter, and nearly all black, and the feet are blackish lead-colour; in *A. ochrolæmus* the bill is thinner and more elongated, yellowish, with the culmen horn-colour, and the feet are pale brown.

ANABATES PULVERICOLOR.—*Synallaxis pulvericolor*, Lafr. MS.

Terricolori-brunneus, interscapulio saturatiore, subtus dilutior; alis extus et cauda omnino rufis: rostro brevi, paulum incurvo, albo; pedibus robustis, plumbeis.

Long. tota 6·2, alæ 2·6, caudæ 2·8; tarsi 0·8; rostri a fronte 0·5.

A single bad specimen of this species belonging to M. de Lafresnaye, and kindly lent to me by him along with other specimens selected from this collection, bears the MS. name *Synallaxis pulvericolor*. It appears, however, to me to be better placed with *Anabates*, and more nearly resembles the figure given in Buffon's Pl. Enl. of *Anabates guianensis*, which is the type of the genus, than anything I have yet seen. Had it been from Guiana instead of the Rio Napo, I should have thought it was probably referable to that long-lost species.

It certainly is not a typical *Anabates*, speaking of the set of birds commonly so called, the bill being shorter, straighter, and smaller than in these birds generally, though not very different from that of *Anabates erythrophthalmus*, but it is more nearly allied to *Anabates* than to any species of *Synallaxis* with which I am acquainted.

SYNALLAXIS BRUNNEICAUDALIS. — *Synallaxis brunneicauda*, Lafr. MS.

Supra olivaceo-brunnea, alis extus et pileo castaneis, subtus obscure cinerascens, lateribus olivaceo indutis: caudæ rectricibus decem, colore saturate purpurascanti-brunneis, plumarum scapis nigris: tectricibus subalaribus ochraceo-flavis: rostro nigro, gonydis basi albicante: pedibus brunneis.

Long. tota 6·5, alæ 2·4, caudæ 2·7, rostri a fronte ·6, tarsi ·95.

A fine large *Synallaxis*, for which I have employed M. de Lafresnaye's MS. name. The only adult specimen is in bad condition. Both the examples belong to M. de Lafresnaye's collection.

SYNALLAXIS ALBIGULARIS.—*Synallaxis albigula*, Lafr. MS.

Supra murino-brunnea; cauda concolore; pileo postico et tectricibus alarum extus rufis; lateribus capitis et corpore subtus cinereis; loris albidis; gula et ventre medio pure albis, lateribus et crisso brunnescenti-cinereis; rostri nigricantis gonyde albicante; pedibus clare brunneis.

Long. tota 5·5, alæ 2·3.

A short-tailed species of *Synallaxis*, as I should judge from the only specimen under observation, in which, however, the medial rectrices are absent. It is very nearly allied to Temminck's *S. albescens*, but differs sufficiently in its white throat and belly, as far as I can judge from the unique specimen.

MALACOCICHLA MACULATA.

Catharus maculatus, J. Verreaux, MS.

Supra nigricanti-schistacea, pileo toto cum capitis lateribus nigerimis; subtus ochracecenti-albida, lateraliter schistacea; gula et pectore summo triangulariter nigro maculatis, maculis quoque in ventris lateribus rotundis, obsolete schistaceis; tectricibus subalaribus nigro-schistaceis; rostro et pedibus flavis.

Long. tota 7·0, alæ 3·6, caudæ 2·8, rostri a fronte ·6, a rictu ·85, tarsi 1·4.

This interesting bird is a close ally of Gould's *Malacocichla Dryas* from Guatemala, and I have therefore placed it in the same genus. It may be distinguished from that species by the dark slaty colour of the back, which in *M. Dryas* is greenish olive. Whether these birds will be ultimately separable from the genus *Catharus* is, I think, questionable; and M. Jules Verreaux is therefore quite as likely to be correct in his appellation of this species as I am in mine. Besides *M. Dryas* from Guatemala (P. Z. S. 1854, p. 285, pl. 75), Prince Bonaparte has described a Mexican species—*M. mexicana* (Compt. Rend. Aug. 2, 1856). The Prince also informed me (after a visit to M. de Lafresnaye's collection, which he made shortly before his decease) that *Myioturdus fuscater*, Lafr. R. Z. 1845, p. 341, belongs to this same genus—so that this is probably the fourth species known.

THAMNOPHILUS ÆTHIOPS.

♂. *Ater unicolor; campterio et tectricibus subalaribus albo variegatis; rostro et pedibus nigerrimis.*

♀. *Castaneo-brunneus unicolor, alis intus obscurioribus, maculis quibusdam tectricum superiorum majorum apicalibus cum campterii margine et tectricibus subalaribus flavicanti-rufis; cauda nigra; rostro et pedibus nigris.*

Long. tota 6·0, alæ 2·8, caudæ 2·5, rostri a rictu ·85, tarsi ·9.

This species is in colour like *T. immaculatus*, of a uniform black; but, whilst that has only a very insignificant white patch on the bend of the wing, the *T. æthiops* has the under wing-coverts as well

as the upper coverts close to the bend varied with white. Besides, the bill is much shorter and stouter, and the whole bird is smaller in its dimensions. Of *T. immaculatus* I make the corresponding measurements:—Long. tota 7·0, alæ 3·3, caudæ 3·0, rostri a rictu 1·0, tarsi 1·3.

THAMNOPHILUS CAPITALIS.

♂. *Cinereus, alis intus obscurioribus; pileo nigro: subtus dilutior, tectricibus subalaribus et marginibus remigum interioribus ochraceo-albidis: cauda nigricante: rostro et pedibus plumbeo-nigris.*

♀. *Umbrino-brunneus; pileo rufo; subtus dilutior, gula albicante: rostro pedibusque plumbeis, illius mandibula inferiore pallidior.*

Long. tota 5·7, alæ 2·5, caudæ 2·0, tarsi ·75.

This *Thamnophilus* belongs to the typical division of the group which contains *T. nævius* and its allies. It is easily distinguishable by its uniform cinereous plumage and black head, and by the absence of all markings on the wings and tail. M. Verreaux's collection contains a male not quite adult and two females of this species.

DYSITHAMNUS LEUCOSTICTUS.

Supra umbrino-brunneus, pileo rufescentiore, pennis omnibus interne cinereis: subtus cinereus, capitis lateribus cum gula et pectore guttis elongatis albis, pennas medias occupantibus, maculatis: ventris lateribus et crisso olivaceo tinctis: cauda obscure nigra, extus brunneo marginata: rostro et pedibus nigris.

Long. tota 5·2, alæ 2·75, caudæ 2·0, tarsi 1·85.

This species is noticeable on account of the clear white elongated shaft-spots on the throat and breast, which distinguish it from other birds of the group. In two younger specimens in MM. Verreaux's collection these spots are hardly yet apparent, and the rich brown edging of the upper plumage is only partly assumed, leaving these parts of a brownish cinereous.

PYRIGLENA SERVA.

♂. *Nigra, subtus magis ardesiaca: macula magna interscapularium interna et tectricum alarium superiorum marginibus apicalibus cum campterio albis; rostro et pedibus nigris.*

♀. *Olivascenti-cinerea, macula interscapularium interna alba: subtus saturate ferruginea; alis caudaque fuscis, tectricum alarium superiorum marginibus et tectricibus subalaribus rufescentibus; rostro superiore nigro, inferiore flavido: pedibus fuscis.*

Long. tota 5·3, alæ 2·5, caudæ 2·3, rostri a rictu 0·8, tarsi 0·9.

Distinguished from *Pyriglena domicella* and *P. atra* by its smaller size. Sir William Jardine recently lent me some specimens of *Formicariidæ* from Quixos, among which were examples of both sexes of this same species. I do not know *Lanius funebris*, Licht. (Dobl. p. 47), from Cayenne, but as far as I can judge from his short characters, it can hardly be identical with the present bird.

HETEROCNEMIS ALBIGULARIS.

Brunnescenti-olivaceus, plumis omnibus nigro obsolete marginatis, alis caudaque nigricantibus; fascia alarum duplici alba: subtus pallide cinerascens, gutture albo, ventre nigricante transversim lineato: rostro nigro, mandibulæ inferioris basi albido: pedibus fuscis.

Long. tota 4·2, alæ 2·35, caudæ 0·9, rostri a rictu 0·9, tarsi 1·0.

Obs.—Affinis *H. Bamblæ* ex Cayenna, sed crassitie paulo majore, rostro longiore et gula alba dignoscenda.

CONOPOPHAGA TORRIDA.

Clare brunnescenti-olivacea, dorsi plumis nigro partim variegatis; capite supra, alis et cauda ferruginescenti-brunneis: tectricibus alarum et secundariis extus macula apicali fulvo-flavida ornatis: plumarum fasciculo postoculari albo: subtus clare ferruginea, gula et ventre medio albicantibus, hypochondriis et ventre imo magis fulvis: mandibula superiore nigra, inferiore cornea: pedibus pallidis.

Long. tota 4·6, alæ 2·8, caudæ 1·2, tarsi 1·0.

M. Verreaux's collection contained a single specimen of this apparently new *Conopophaga*, not in very good plumage. A more perfect example in the British Museum, which is from Chamicurros in Eastern Peru, has furnished my specific characters.

This is a typical species of the genus somewhat allied to *C. lineata* of South-eastern Brazil.

GRALLARIA FLAVIROSTRIS.

Brunnescenti-olivacea, loris et capitis lateribus rufescentibus: subtus alba, pectoris medii et lateralis plumis pallide rufis, utrinque nigro late limbatis, quasi squamatis; gulæ laterum plumis rufo tinctis, fascia nigricante intus marginatis; tectricibus subalaribus pallide rufis; rostro flavo; pedibus clare brunneis.

Long. tota 4·2, alæ 2·7, caudæ 1·1, tarsi 0·9, rostri a rictu 0·7.

This diminutive *Grallaria* is very like the Venezuelan bird which I described in the Proceedings for last year (P. Z. S. 1857, p. 129) under the name of *G. loricata*. Like that, it has a pectoral band formed by the black margins of the pale rufous feathers; but in the present species the band is much narrower, and the head is not chestnut.

GRALLARIA FULVIVENTRIS.

Olivaceo-brunnea, pileo obscuriore, alis extus magis rufescentibus, loris albidis: subtus gula et abdomine medio albis, pectore, ventris lateribus et crisso cum tectricibus alarum inferioribus saturate fulvis, pectore lineis quibusdam nigris variegato: rostro superiore nigro, inferiore, nisi apice, flavo: pedibus pallide brunneis.

Long. tota 5·5, alæ 3·2, caudæ 1·4, tarsi 1·5, rostri a rictu 0·95.

This *Grallaria* seems to belong to a species distinct from anything

yet described. The bird most resembling it of those I have met with, is *G. macularia*, of which there are specimens in the Leyden Museum; but that is rather a peculiar species, remarkable for its denuded orbits and short, strong hind-nail, while this bird has the hind-nail slender and rather long, and is in every respect a typical member of the genus.

Genus novum AGATHOPUS.

Rostrum modicæ longitudinis, brevius quam caput, subulatum, culmine recto, ad apicem paulum incurvo, gonyde ascendente, mandibula superiore ad apicem dentata, naribus, prout in omnibus hujus familiæ generibus, coopertis: alæ brevissimæ, rotundatæ, remige septima sextam et quintam paulo excedente et longissima, tertia secundarias æquante: pedes validi, tarsi longis, antice scutellis novem regularibus, postice scutellis minutis, tectis; unguibus curvatis, acutis; cauda modicæ longitudinis, multum rotundata, rectricibus duodecim, extimis dimidio brevioribus, ceteris gradatim longioribus; tectricibus supra-caudalibus densissimis.

AGATHOPUS MICROPTERUS.

Obscure nigricanti-schistaceus, dorso postico cum ventre imo, lateribus et crisso saturate brunneis, radiis transversis nigris, in tergo vix apparentibus, subobsolete variegatis: rostro nigro, pedibus clare brunneis.

Juvenis.—Radius transversis nigris omnino obtectus, gula magis cinerascens, et colore toto magis brunneo.

Long. tota 3·3, alæ 2·3, caudæ 1·9, rostri a rictu ·7, tarsi 1·0.

This curious bird, of which the collection contains two examples, seems intermediate in form, as in size, between *Merulaxis atra* and the *Scytalopodes*. From the former it differs in the shape of the bill, which is shorter, has the gonyes curved upwards, and wants the elevated feather-tufts on the front; from *Scytalopus* it is distinguished by its thicker, stronger and larger bill, longer tail, and longer tarsi. These genera, along with *Pteroptochus* and its allies, appear to me to constitute a well-distinguished group, for which I propose to use the term *Pteroptochidæ*, deduced from the oldest and best-known genus (instead of Lafresnaye's name *Rhinomydæ*) according to the orthodox rule for forming the names of families. The distinctions of these birds as a group are well pointed out in the Ornithology of D'Orbigny's Voyage (p. 192), and their most essential character, as is there stated, consists in the covered nostril, only a narrow longitudinal aperture being left, which occurs in every species. They must certainly be arranged next to the *Formicariidæ*, within the limits of which they have been placed by Cabanis and other writers; and I am not myself certain that it may not be possible to consider them only as a sub-family belonging to that series.

TODIROSTRUM PICATUM.

Supra nigrum, loris et secundariarum trium ultimarum pogoniis
Ann. & Mag. N. Hist. Ser. 3. Vol. ii.

externis cum macula rectricis unæ utrinque extimæ apicali albis, his flavicante tinctis; subtus album, tectricibus subalaribus et margine campterii flavicanti-albis: rostro superiore nigro, inferiore albo; pedibus pallide fuscis.

Long. tota 3·5, alæ 2·1, caudæ 1·3, rostri a fronte 6·0, tarsi 6·5.

This peculiar *Todirostrum* is quite unlike any other known member of the genus in colouring. In structure it is generally typical, but with the bill not quite so broad towards the apex as in some others.

CYCLORHYNCHUS ÆQUINOCTIALIS.

Clare olivaceus, remigibus alarum nigricantibus flavicanti-viriditate limbatis; cauda fusca, rectricum marginibus dorso concoloribus: subtus flavicans, gula grisescente; pectore et lateribus cum crisso olivaceo perfusis; tectricibus subalaribus sulphureis; rostro superiore nigro, inferiore albo; pedibus carneis.

Long. tota 6·0, alæ 2·6, caudæ 2·3, rostri a rictu 0·8, tarsi 0·7.

This bird is a close ally of the Brazilian *Cyclorhynchus olivaceus*, but may be distinguished by its shorter wings and tail, and by the pure yellow of the middle of the abdomen.

March 9, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

A MONOGRAPH OF THE GENUS MINIOPTERIS.

By ROBERT F. TOMES.

Perhaps there is no order of Mammalia in which there is so great a diversity in the forms of the different species as in the *Cheiroptera*. On examining the genus *Vespertilio* in the extended form in which it is given by M. Temminck, and more recently by M. Wagner, the naturalist will find an assemblage of creatures which he will have great difficulty in making out to his satisfaction. But in endeavouring to separate them into groups or genera for the purpose of description, he will be equally puzzled. An examination of the British species merely, will illustrate the nature of the difficulty to which I refer. Take, in the first place, the common *Noctule Bat*, and the equally common *Whiskered Bat*, the one exhibiting a heavy muscular body, and strong wings capable of vigorous and sustained flight, and with jaws and teeth of sufficient size and power to masticate a Cockchafer whilst on the wing with perfect ease; and the other species having a slight and feeble body, with very slender wing-bones supporting a membrane of equal delicacy, suited only for flight in sheltered spots, and with a muzzle and teeth of such small size as to be fitted only for taking minute food in such situations.

The difference between the two is quite sufficient to justify generic separation, and the work is easy so far as these two species are concerned; but unfortunately a whole host of species come in between them, and bring such a series of small modifications as to reduce the distinction to one of *degree* only; so that in attempting to separate

them the results are anything but satisfactory. And it is scarcely necessary to go beyond the European list to meet with an unbroken series from the one to the other. Under these circumstances, any character which could be found sufficiently marked to show a difference apart from that of degree, however small it might be, would be valuable as a means of classification.

In default of any single character which might be considered sufficient for this purpose, a certain combination of characters, not in themselves sufficiently distinctive taken separately, might nevertheless, if taken collectively, answer the desired end; and further, the decision would be strengthened if we were to find that these characters were so precisely uniform in *degree*, as to afford no specific differences beyond those of the size of the animal and the quality and colour of the fur.

Such is literally the case with the group which I have now to consider. Although inhabiting widely separated localities—Europe, Asia, Africa and Australia,—its several members scarcely exhibit any greater differences than those above noted, viz. colour and size.

The genus *Miniopterus* was first proposed by Prince C. L. Bonaparte in his fine work on the Fauna of Italy, for a species which was there described as *Miniopterus Ursinii*, being regarded as new. It has however been subsequently shown by MM. Keyserling and Blasius, that this species is identical with the one described a long time previously by Natterer, in Kuhl's 'Memoir on the Bats of Germany,' under the name of *Vespertilio Schreibersii*. The specific name given by Natterer is the one now generally admitted, whilst the generic one given by Prince C. L. Bonaparte is refused or adopted according to the opinion respecting the generic distinctions.

In the following monograph the generic peculiarities will first be pointed out; and this will be followed by a detailed description of the earliest-described and best-known species—the European one, after which the points of dissimilarity in the other species will be adverted to*.

Genus MINIOPTERIS, Bonap.—*Trilatitius*, Gray (in part).

Top of the head much elevated; face very short, concave in its longitudinal direction; muzzle obtuse, not much depressed; nostrils near together, with their upper and inner margins slightly projecting, the space between these projecting parts being slightly emarginate. This notch between the nostrils does not, however, pass downward through the upper lip, which is entire and rather prominent. The nostrils themselves are crescent-shaped and open sublaterally. From the outer side of each is a vertical notch or groove passing through the lip, but leaving its central portion entire and

* I am aware that some zoologists regard the Asiatic and African representatives of the genus as referable to the European one, an opinion in which I partially concur. The African one, *Vespertilio dasythrix* of Temminck, is I believe identical with *Miniopterus Schreibersii*; but the Asiatic ones occurring in the islands of the Indian Archipelago and in Australia, I believe to be perfectly distinct species.

slightly projecting*. Lateral parts of the lip thick and overhanging.

Lower lip with a distinct and clearly defined reflex central portion, as in *Natalus*, but of much less extent.

Ears angular-round, very short; tragus short, of uniform breadth, round at the end, and curved inwards. Tail as long as the head and body. Wing-membranes extending to the *extremity of the tibiæ*. Os calcis short. Cutaneous system ample; *middle phalange of the second and third finger very short*. Fur very thick and soft.

Skull with the bony palate extending backwards as far as the molar series only. Intermaxillary bones nearly meeting in front, so as to allow space for a considerable interval on each side between the outer incisors and the canines, and leaving only a small interspace between the two inner incisors. Incisors placed across the opening between the canines.

1. MINIOPTERIS SCHREIBERSII.

Vespertilio Schreibersii, Natt. in Kuhl, Wetter. Ann. iv. 41, 1817; Desm. Mamm. p. 138, 1820; Fisch. Synop. Mamm. p. 104, 1829; Temm. Mon. Mamm. ii. p. 174, 1835-41; De Selys-Longch. Etude Micro-mamm. p. 138, 1839; Wagn. Supp. Schreb. Saugth. i. 508, 1841.

Miniopterus Schreibersii, Keys. et Blas. Wieg. Arch. v. 323, 1839; Die Wirbelthiere Europ. p. xiii. et 44, 1840; Less. Nouv. Tab. Règne Anim. p. 27, 1842.

Miniopterus Ursinii, Bonap. Faun. Ital. fasc. 21. fol. 106, 1832-42; Gray, Mag. Zool. & Bot. ii. 497, 1838; De Selys-Longch. Etude Micro-mamm. p. 139, 1839; Less. Nouv. Tab. Règne Anim. p. 27, 1842.

Vespertilio Ursinii, Temm. Mon. Mamm. ii. p. 179, 1835-1841.

Vespertilio dasythrix, Temm. Mon. Mamm. ii. p. 208.

Vespertilio Natalensis, Smith, South African Quart. Journ. new ser. v. 1, 1832.

Miniopterus dasythrix, Smith, Ill. Zool. S. Africa, no. 27. pl. 52, 1848; Schinz, Synop. Mamm. i. p. 166, 1844.

The crown of the head is very much elevated, and the face so much depressed as to give the appearance of a deep hollow across its middle. The muzzle is very short and round, but it is not itself much depressed, as in the flat-headed species such as the *Noctule*. From the great concavity of the middle part of the face, the muzzle appears to have an upward direction. The nostrils are small, near together, and in the specimens preserved in spirit are directed nearly

* This projecting part of the upper lip is somewhat singular. Separated by the two vertical grooves above mentioned, it is well and clearly defined, and has somewhat the appearance of the cartilaginous fore part of the palate of some Ruminants, as that of the Sheep. Its surface is conspicuously granular, and in size it exactly corresponds with the naked reflex portion of the lower lip, so that when the mouth is closed the two parts fit closely together.

straight forward; but in dried specimens they have a sublateral direction.

The ears are very short, somewhat quadrangular in form, with the angles rounded, and have their outer margin brought forward along the face in the form of a very narrow strip of membrane to near the corners of the mouth. The inner margin rises from the side of the head in a perpendicular direction for a very short distance, and then making an angle, which if not rounded off would be a right angle, proceeds outwards in nearly a straight line, and forms another similar rounded angle with the outer margin. About the middle of the outer margin is a slight hollow.

The tragus reaches fully halfway up the ear, and in actual measurement nearly equals it in length, both being viewed as simple projections and measured along their central lines. Its form is somewhat similar to that of the tragus of the common *Pipistrelle*; but it is relatively longer and narrower, of absolutely uniform breadth, and with the tip more regularly rounded. It curves inwards for the whole of its length, but most strikingly so about one-fourth of the distance from the end.

The wings are long in relation to the size of the animal, and the longest finger is fully twice the length of the fore-arm. The middle phalanges of the two longest fingers in the wing are very short, but the relative lengths of the same parts in the other fingers are not remarkable. In the relative proportions of these bones to each other, they closely resemble the same parts in *Furipterus*, but in no other group that I have had the opportunity of examining. Thumb of medium length and size, with the terminal phalange a little longer than the basal one; its claw rather strongly hooked.

The wing-membranes are attached as far as to the extremity of the tibiæ.

The hinder limbs are of medium proportion; but the feet are rather large, and have the toes of about one-half of their entire length. The claws, although of moderate size, are strongly hooked.

The tail is long, and is composed of nine vertebræ, and is fully equal in length to the head and body. It is wholly enclosed by the interfemoral membrane, which has about thirteen transverse dotted lines, which are very near together on its basal portion. All the membranes are somewhat diaphanous, but present no great peculiarities of reticulated or other markings.

The fur is soft and thick, of medium length, and rather faintly bicoloured, both above and below. That of the upper parts is dark brownish grey at the base, its terminal half paler and strongly tinged with brown. Beneath it has similarly coloured roots, with palish grey-brown tips. Such is the colour of the European examples. Those from Algeria are characterized by a strong ashy tinge over the whole of the fur, and in some specimens the pubal region is wholly ash-coloured. Examples from Lake Ngami have all the upper parts of the body of a deep brownish grey (similar in colour to the roots of the hair in the European specimens), with the extreme tips of the hairs slightly paler, but not browner. Beneath,

the fur is nearly black at its base, and tipped with ash colour; and the latter colour prevails around the region of the pubes. The specimens from this locality represent the *Vesp. dasythrix* of M. Temminck, and correspond pretty accurately with his description; but specimens from the Cape are described by Dr. A. Smith as having the upper parts "intermediate between chestnut-brown and yellowish brown," and the under parts "dull pale brownish red, tinged with wood-brown and yellowish brown, in places strongly tinted with pale reddish orange." I have seen no African example of this colour.

The cerebral region of the skull is very much elevated, almost as much so as in *Furipterus*, the evenness of its convexity being interfered with only by a narrow transverse depression occupying the position of the suture uniting the occipital with the parietal bones, by a moderately developed sagittal ridge, most conspicuous on the frontal region, and by an occipital crest of similar degree of development.

The facial part of the cranium is very much depressed, and it is also considerably compressed. The intermaxillary bones are, as in *Furipterus*, more developed than is usually the case among the *Vespertilionidæ*, affording sufficient space for the incisors to be inserted in a nearly perpendicular position, and at the same time to leave a considerable interval between them and the canines. It is worthy of remark, that in this, as in the crania of the other species of the genus, the antorbital foramina are placed more forward than usual, only just behind the canines. The nasal opening is rather small, and the corresponding notch in the front of the palate proportional to it in size. The orbit is small, and the zygomatic arches have a very moderate lateral curvature. As in other species having a dome-shaped cranium, the condyloid fossæ are in a line high above that of the teeth, and the zygoma in consequence starts at an angle from the line of the dental series and passes upwards and backwards to the condyle. In those species which, like the common *Noctule*, have a flat cranium, with both the facial and cerebral surfaces in one continuous line, the dental series and the zygoma are in nearly a continuous line also.

The bony palate presents one peculiarity, viz. that it scarcely extends posteriorly beyond the last molar, whereas in the generality of the *Vespertilionidæ* it reaches as far backwards as halfway between the last molar and the condyles, and in some instances reaches even so far back as to the latter.

The lower jaw does not present any great peculiarities of structure. It has a rounded *posterior angle*, to adapt itself to the elevated position of the cranial condyles, and a distinct and well-marked *posterior process*, about halfway between the *angle* and the *condyloid process*. The *coronoid process* is of ordinary form and on a level with the *condyle*.

Viewed in front, the upper incisors are seen to be in two pairs, which are separated by a moderately wide opening in the centre, and by another of less extent on each side, between them and the canines; but the teeth in each of these pairs are placed close together. In

direction, their tips point a little inwards. Seen laterally they are nearly vertical.

In form they present no remarkable deviation from what is common in the genera *Vespertilio* and *Scotophilus*: they are of nearly equal length, the two nearest the canines simple in form and somewhat blunt, the inner ones more pointed and with a kind of basal cusp or point near to the outer ones. The canines are of medium size, and conical, with but little angularity, and possessed of a moderately developed *cingulum*. The first pre-molar is small, and has a central pointed cusp, surrounded by a flattish space, from the centre of which it projects. Its general appearance is that of a diminutive canine having an exceedingly broad *cingulum*. Succeeding to this, and contiguous to the first true molar, is a tooth which may be regarded as taking the place of the sectorial tooth of the Carnivora; it is rather long and pointed, with an inner basal ring, which is considerably developed in the direction of the palate.

The true molars have nothing remarkable either in number or form.

In the lower jaw the incisors exhibit a slight deviation from the usual type. The four central ones are small and trilobed; but the two outer ones are conspicuously larger, and instead of having a thin lobated edge, have a roundish flattened crown with a transverse cleft through its centre, for the reception of the point of the outer upper incisor when the jaws are closed.

The lower canines are of the ordinary form; but it is worthy of remark, that the basal ring or collar is considerably developed, running off into a flat basal space in the direction of the first pre-molar, but rising up into a kind of blunt accessory cusp near to the large incisor already mentioned.

This form of canine cannot, however, be instanced as peculiar to the genus, since I find that the additional cusp occurs more conspicuously in some other species, as the common *Noctule Bat*, and the equally common *Long-eared Bat*; whilst in some others, as the *Kerivoula picta* and the *Barbastelle*, it appears as a mere ring of enamel around the base of the tooth.

The three following teeth are of a very simple form, conical and pointed, surrounded by a *cingulum* which is rather more developed on the inside of the teeth than on the outer. They increase in size evenly and rapidly, so that the one contiguous to the molars is the highest tooth in the jaw, excepting the canine, and even to that it is not greatly inferior.

The only peculiarity I am able to note respecting the true molars is, that the first has its anterior inner cusp so much produced as to be nearly even with the outer anterior one, usually much the highest.

The numeration of the teeth may be thus stated:—

$$\text{In. } \frac{2-2}{6}; \text{ Can. } \frac{1-1}{1-1}; \text{ Prem. } \frac{2-2}{3-3}; \text{ Mol. } \frac{3-3}{3-3} = \frac{16}{20}.$$

The dimensions in column 1 of the following table are those of a specimen from the Bannat; 2, those of one from Sicily: both preserved in spirit. Column 3 contains the dimensions of the mutilated

skeleton, which is all that remains of the type of Prince Bonaparte's *Miniopteris Ursinii*; whilst column 4 refers to a specimen collected in Algeria in 1856 by the Rev. H. B. Tristram, and very kindly presented to me; and columns 5 and 6 refer to specimens from Lake Ngami, collected by Mr. Anderson. The three last-mentioned specimens are all preserved in skin, and their dimensions are therefore less to be depended on than those of the specimens in spirit.

	1.		2.		3.		4.		5.		6.	
	in.	lin.	in.	lin.	in.	lin.	in.	lin.	in.	lin.	in.	lin.
Length of the head and body...	2	3	2	3	.....	.....	2	9	2	4	2	3
— of the tail	2	3	2	1	1	10	2	0	.....	.....	.....	.....
— of the head	0	8½	0	8½	.....	.....	0	8½	0	8½	0	8
— of the ears	0	3	0	3	.....	.....	0	3	0	3½	0	3
— of the tragus	0	2	0	2½	.....	.....	0	2	0	2	0	2½
— of the fore-arm	1	9	1	9	1	8¾	1	8½	1	9	1	8½
— of the longest finger ...	3	6	3	5	3	3	3	4	3	5	3	3
— of the fourth finger ...	2	2	2	0	2	0	2	1	2	2	2	0
— of the thumb	0	4	0	3	0	3½	0	3½	0	3½	0	3½
— of the tibia	0	9	0	8½	0	7¾	0	8¾	0	8½	0	8¾
— of the foot and claws...	0	5½	5	0	0	4¾	0	5	0	4½	0	4¾
Expanse of wings	14	0	13	0	13	6	12	9	13	0	12	6

2. *M. BLEPOTIS.*

Vesp. blepotis, Temm. Mon. ii. p. 212, 1835–41; Müller, Over. Zoog. d. Ind. Archiv, p. 23, and table; Schinz, Synop. Mamm. i. p. 172, 1845.

Miniopteris blepotis, Blasius, Wieg. Arch. Bd. 6. p. 4, 1840.

Pipistrellus blepotis, Less. Nouv. Tab. Règn. Anim. p. 30, 1842.

Trilatitius blepotis, Gray, Ann. & Mag. N. H. v. 10. p. 258, 1842; Cat. Mamm. Brit. Mus. p. 26, 1843; Zool. Voy. Samar. p. 8, 1849.

Scotophilus Morio, Gray, App. Greg's Narrat. p. 405, 1841; Cat. Mamm. Brit. Mus. p. 29, 1843; Wieg. Arch. Bd. 8. p. 339, 1842; Schinz, Synop. Mamm. i. p. 192, 1844.

Vesp. Eschscholtzii, Waterh. Proc. Zool. Soc. 1845, p. 4.

Noctulinia ? Eschscholtzii, Gray, Zool. Voy. Samar. p. 9, 1849.

The following comparison of this species with the last has been made between a great number of examples of both, most of those of *M. blepotis* being preserved skins, whilst the greater part of those of *M. Schreibersii* have been preserved in spirit. It is necessary to make this statement before proceeding further, as the foregoing description of the latter species was drawn up from the specimen in spirit, whereas the stuffed specimens of both species have been resorted to in the following comparative description. Unfortunately I have not yet obtained a sufficient number of *M. blepotis* in spirit to be able to give as many details as I could desire.

Compared with *M. Schreibersii*, the face of the present species appears more elongated, although still very short; and it is rather more pointed, and has the nostrils more prominent. The ears, too, are relatively somewhat longer.

In quality the fur is pretty similar, from whatever locality the animal may have been obtained. That of the upper parts is uni-

coloured, sometimes having the tips of the hairs a little paler. In *M. Schreibersii* it is bicoloured. The general colour is very dark brown, varying slightly in its hue according to the locality from which the examples have been obtained. Beneath it is bicoloured in both species. In the present one it is dark brown at the base, tipped with a paler tint of the same colour, which latter occupies the whole length of the hairs on the pubal region.

Examples from Japan have for the most part a rich umber tinge in the colour of the fur; in others from Amboyna a black-brown is the prevailing colour, still however with a reddish tinge, whilst the majority of those from Australia have the fur of a very deep brown colour without such tinge. There is, however, a remarkable variety sometimes met with in the latter country, which may be thus mentioned:—The fur of the head and fore part of the back is of the ordinary sombre colour, but that of the loins and rump is on the contrary of a bright chestnut-brown, very silky and shining, and the change from one colour to the other is not effected by a regular gradation, but takes place almost abruptly, a wavy irregular line across the loins marking the confines of the two. But in one or two specimens which I have seen, the chestnut colour extends up the middle of the back in a narrowish line, almost to the shoulders, and produces a very marked and beautiful variety*. In these specimens the region of the pubes also is lighter in colour than in the ordinarily coloured individuals.

I have not been able to examine examples of this species taken at different periods of the year, so as to follow out the notes given by M. Temminck of the seasonal changes in the colour of the fur.

Some differences are observable in the crania of this and the last species, which deserve mention. From the greater length of the muzzle, as already noticed, it might be expected that the cranium also would exhibit some corresponding elongation of its anterior part, and accordingly that is seen to be the case. On comparing the two skulls, that of *M. Schreibersii*, besides being altogether the smaller one, has the facial portion more compressed immediately in front of the orbits, and is less depressed. The posterior part of the palate also is narrower, so that the zygomatic arches spring at once *outwards* from the maxillary bones; whilst in *blepotis*, where this part of the skull is relatively broader, the zygoma passes off in a *backward* direction, scarcely making an angle with the outer surface of the maxillary bones.

Another very apparent difference consists in the much greater

* Somewhat the same style of colouring occurs in the *Scotophilus Gouldii*, also from Australia, and in some examples there is a slight tendency towards the same peculiar division of the two colours. *Scotophilus tuberculatus* also, from New Zealand, is very similarly coloured; but the gradation from the dark fore parts to the more rufous hinder parts is very slight and uniform.

Mr. Blyth has remarked of many of the Indian Bats, that they are subject to what he calls a *rufous phase*: perhaps this remark may be extended to the Australian examples of the present species, although why this should not equally take place with those inhabiting the islands of the Indian Archipelago, is rather difficult to decide.

length and substance of the teeth, especially the canines in *M. bleepotis*. In this species the upper canines are so long as to pass, when the jaws are closed, almost to the lower margins of the lower jaw, whilst in *M. Schreibersii* their points reach only to about the middle of the ramus. It is also deserving of notice, that the singularly formed outer incisors of the lower jaw exhibit the peculiarity already alluded to in a much greater degree in this species than in *M. Schreibersii*, or indeed than in any other species appertaining to the genus.

Columns 1, 2 and 3 in the following table of dimensions refer to specimens from Japan, 4 and 5 to specimens from Amboyna, and 6 to the specimen in the collection of the British Museum, from which Mr. Waterhouse took his description of *V. Eschscholtzii*.

	1.		2.		3.		4.		5.		6.	
	in.	lin.	in.	lin.	in.	lin.	in.	lin.	in.	lin.	in.	lin.
Length of the head and body...	2	6	2	9	2	6	2	5	2	6	2	1
— of the tail	2	0	2	2	2	2	1	9	1	9	2	1
— of the head	0	8	0	9	0	9	0	8	0	9	0	8½
— of the ears	0	3	0	3	0	3½	0	3	0	3	0	3
— of the tragus	0	2	0	2½	0	2½	0	2½	0	2½	0	2½
— of the fore-arm	1	9	1	9	1	9	1	8	1	10	1	9½
— of the longest finger ...	3	6	3	6	3	7	3	3	3	8	3	7
— of the fourth finger ...	2	0	2	1	2	2	2	0	2	2	2	4
— of the thumb	0	4	0	4	0	4	0	3½	0	3½	0	3½
— of the tibia	0	9	0	8½	0	9	0	8	0	9	0	8½
— of the foot and claws ...	0	4	0	4½	0	4½	0	4	0	4½	0	4
Expanse of wings.....	14	0	14	0	14	0	12	6	14	0	13	6

The specimens, the dimensions of which are given in the next table, formed part of Mr. Gould's Australian collection, and were obtained at several localities. They have been selected from a considerable number as fair representatives of the so-called *Scotophilus Morio*.

	1.		2.		3.	
	in.	lin.	in.	lin.	in.	lin.
Length of the head and body ..	2	8	2	9	2	8½
— of the tail	2	2	1	9	2	3
— of the head	0	9	0	9	0	8¾
— of the ears	0	3½	0	3¾	0	3¼
— of the tragus	0	2¼	0	2½	0	2½
— of the fore-arm	1	10	1	9½	1	9
— of the longest finger ..	3	6	3	6	3	6
— of the fourth finger. ...	2	2	2	3	2	1
— of the thumb	0	3½	0	4	0	4
— of the tibia	0	9	0	9	0	8¾
— of the foot and claws ..	0	5	0	5	0	4¾
Expanse of wings.	13	10	14	0	13	6

3. M. TRISTIS.

Vespertilio tristis, Waterhouse, Proc. Zool. Soc. pt. xiii. p. 3, 1845; Gray, Zool. Voy. Samar. p. 31, 1849.

The muzzle of this species is relatively broader and more obtuse than in any other species of the genus; and this peculiarity, together

with its superior size, is sufficient at once to distinguish it from the last species, which it otherwise resembles. The peculiarity pointed out by Mr. Waterhouse of having the nostrils directed sublaterally, whilst in the allied species *M. blepotis* they open almost in front, does not, I think, furnish a very valuable character in any of the species which have the glands of the upper lips much developed. When these glands are large, they often advance so far forward as to thrust the outer margins of the nostrils forward also, or at any rate to close up the vertical notch already mentioned as separating the lips from the nostrils. This gives the latter the appearance of opening directly in front, whereas in the same species when examined in a dry state, when the lips have shrunk and produced a more pointed muzzle and prominent nostrils, the latter are found to open more or less laterally. And as it is not uncommon to meet with different individuals of the same species (in this genus) having these glands developed in a slightly different degree, so it is common to observe a corresponding difference in the nostrils. A good number of examples will alone supply the necessary materials by which to distinguish truthfully the characters of allied species. It remains therefore, as I think, to be proved by the examination of a greater number of examples, that this species differs essentially in what may be called a generic peculiarity from the so-called *Vesp. Eschscholtzii*, or that the latter differs from the *Vesp. blepotis* of M. Temminck.

I can detect no difference in the distribution or quality of the fur from the species last described. It is unicoloured, and the general colour is very deep brown, as in the Australian specimens of *M. blepotis*. When seen in spirit, it appears to be sooty black.

As far as is at present known, this species is confined to the Philippine Islands.

	in.	lin.
Length of the head and body	2	6
— of the tail	2	5
— of the head	0	10½
— of the ears	0	4
— of the tragus	0	2¾
— of the fore-arm	2	1
— of the longest finger	4	3
— of the fourth finger	2	5
— of the thumb	0	3½
— of the tibia	0	10
— of the foot and claws	0	5½
Expanse of wings	15	6 or 16 in.*

* It will be observed, that the dimensions I have given differ a little from those given by Mr. Waterhouse, both taken from the same specimen. But the difference is very trifling in all respects save in the expanse of the wings, and here a good deal depends upon the measurer. I have usually taken this dimension by means of a thread extended along the bones of the wings to the shoulders, and then taken the breadth between them with a pair of compasses.

If the expanse be taken in a straight line between the tips of the open wings,

4. *M. AUSTRALIS*, n. s.

This species differs from *M. blepotis* in having the face more hairy, the ears relatively smaller, and the thumb much smaller, and in being itself much smaller. The fur too of the under parts encroaches somewhat on the membranes, whilst in *M. blepotis* the latter are quite free from fur.

M. Temminck, speaking of the latter species, says, "La femelle n'a guère plus de 3 pouces 4 lignes (of length); envergure à-peu-près 10 pouces; antibrachium 1 pouce 6 lignes;" which statement of dimensions appears to apply with moderate accuracy to the present species. It is not, however, the female of *M. blepotis*, as I have examined specimens of both sexes, adult and immature; and if neither age nor sex will explain the great difference in size, it must be regarded as a very remarkable variety or as a distinct species. The fact of its occurrence over a very considerable range of country—the Indian islands and Australia, inhabiting alike island and continent without manifesting any difference in appearance, is very strong evidence against its being a mere variety, and in my opinion fully establishes it as a distinct species.

The general colour of the fur is very similar to that of *M. blepotis*; but the generality of specimens have a more decided rufous tinge, which is given by the tips of the hairs being paler and redder than the base. But this is not perceivable in some individuals, and thus they are of the ordinary sombre colour of the Australian examples of *M. blepotis*.

In the following Table of Dimensions, columns 1 and 2 refer to adult males, 3 to an adult female in young, 4 to a youngish male with the wing-joints imperfectly ossified, all of them being preserved in spirit in the British Museum; and column 5 to a specimen in skin in the same collection,—the whole of them having been collected in Australia by Sir G. Grey, K.C.B., and presented to the National

	1.		2.		3.		4.		5.		6.	
	in.	lin.	in.	lin.	in.	lin.	in.	lin.	in.	lin.	in.	lin.
Length of the head and body...	1	11	1	9	1	8	1	8	1	7	2	0
— of the tail	1	9	1	8	1	8	1	6	1	5	1	5
— of the head	0	8	0	7½	0	7½	0	7½	0	7½	0	7
— of the ears	0	3	.....	.....	0	3½	0	3½	0	3	0	3
— of the tragus	0	2½	.....	.....	0	2	0	2½	0	2	0	2
— of the fore-arm	1	7	1	6½	1	5	1	6	1	5½	1	5
— of the longest finger ...	3	0	.....	.....	2	8	2	8	2	9	2	8
— of the fourth finger ...	1	10	.....	.....	1	8	1	8	1	8	1	8
— of the tibia	0	7	.....	.....	0	7	0	7	0	6	0	6½
— of the foot and claws...	0	4½	.....	.....	0	3½	0	3½	0	4	0	3½
Expanse of wings	11	8	11	0	10	6	10	7	11	0	10	6

Collection. The dimensions in column 6 have been taken from the specimen of *M. blepotis* mentioned in Dr. Gray's 'Catalogue of

it must be evident that the length of this line will depend on their complete or partial expansion, and in dried specimens it is almost impossible to have them all with the wings in an exactly similar position. It is on this account that I have adopted the method just stated.

the Mammalia of the British Museum,' as having been received from the Leyden Museum, its country being Timor. It is probable, therefore, that this may have been mistaken by M. Temminck for the female of that species. Be this as it may, the specimen in question is certainly a *male*, and the perfectly ossified condition of the wing-joints indicates that it is *adult*.

The name under which I have described this species was given under the impression that it was exclusively a native of Australia. It was not until after I had arranged and named the specimens in the British Museum and in some other collections, that I found it to be an inhabitant of Timor (and probably of other islands of the Indian Archipelago) as well as of Australia, and that the name of *australis* was not strictly appropriate. But to avoid the confusion which might possibly arise from a change of name, I have thought it desirable that it should remain unaltered.

Of the two following species I am unable to give as complete an account as I could wish.

The first is exhibited in the Leyden Museum with the name of *Vesp. tibialis* affixed, but I am not aware that any description of it has appeared. In that collection there are four specimens, all from Amboyna. A single specimen in my own collection, received also from Amboyna by MM. Verreaux, although in a somewhat mutilated condition, will nevertheless furnish a sufficiently complete description by which to recognize the species, if species it really is.

In general appearance it closely resembles *M. bleoptis*, but is a trifle smaller, and moreover appears to differ remarkably in all the specimens, in having the extremity of the tibia perfectly free for nearly a third of its length. The wing-membranes do not extend beyond two-thirds of the length of the tibia, and the *os calcis* adheres closely to it up to the same point, and then starts from it at nearly a right angle, so that the extremity of the limb is completely unencumbered, and appears like a slender shank.

If this peculiarity is persistent, and not due to the state of preservation, it would mark out a very distinct and good species; but it is very desirable that other specimens be examined that have been preserved in spirit, in which state they show these parts in a more natural condition. It is worthy of note, however, that all the specimens present precisely the same appearance; that is, the leg is free for the same length, and this would hardly be the case were it due to the state of the preservation merely. On the other hand, the species so closely resembles in all other respects the *M. blepotis*, that one may well hesitate and view with suspicion a species having only a single point of difference.

The following are the dimensions of the specimen in my own collection:—

	in.	lin.
Length of the head and body, about	2	6
— of the head	0	7
— of the ears	0	3½

	in.	lin.
Length of the tragus	0	2
—— of the fore-arm	1	6½ or 7 lin.
—— of the longest finger	2	11
—— of the fourth finger	1	8
—— of the tibia	0	7
—— of the tibia, free part	0	7
—— of the foot and claws	0	3½
Expanse of wings	11	6

The other species to which I have alluded bears considerable resemblance to the one I have called *M. australis*. A single specimen in the British Museum, received from the Stockholm Museum with the name of *Vesp. scotinus* affixed, furnishes all the information I possess respecting it, excepting that it is also labelled "Port Natal." I am not aware that any description has been published.

The fur of the upper parts is fuliginous-brown, with the tips a little paler and greyer in hue. Beneath similar, but with the tips of the fur paler, especially about the pubes. The general colour more nearly resembles the darker examples of *M. Schreibersii*, which have been described as *V. dasythrix*, than any other species; and possibly it may prove to be a small example of that species.

The examination of a single specimen does not, amongst allied species, afford sufficient evidence for a satisfactory decision; and I prefer therefore to leave undecided the claims of the present so-called species, until further information afford more ample means of deciding.

The following are the dimensions :—

	in.	lin.
Length of the head and body, about	1	10
—— of the head	0	7
—— of the ears	0	3
—— of the tragus	0	2
—— of the fore-arm	1	6
—— of the longest finger	2	4
—— of the fourth finger	1	11, nearly.
—— of the thumb	0	3¾
—— of the tibia	0	8½
—— of the foot and claws	0	5
Expanse of wings, about	12	6

MISCELLANEOUS.

Further Observations on the Genus Teredina, Lamarck.

By Dr. J. E. GRAY, F.R.S. &c.

WHEN I sent my paper on *Teredina* (p. 85), I was not aware that M. Deshayes had written a long article on this genus, illustrated with several most instructive figures, in the new edition of his 'Coquilles Fossiles de Paris,' p. 122. t. 3 & 4.

He sums up his conclusions thus:—

“ Nous connaissons actuellement tous les caractères extérieurs des *Térédines*. Une coquille de Taret, portant l'écusson d'une *Pholade*, est constamment soudée à l'extrémité d'un tube analogue à celui du Taret, mais dont l'extrémité est plus semblable à celle des *Gastrochènes*,” p. 122.

After reading M. Deshayes's observations with care, I am still of opinion that the real explanation of the genus is, that the tube of the *Teredina* has no affinity with the tubular sheath of the *Teredo*, as M. Deshayes continues to believe, and that it is only the fleshy siphons of the animal which have been lined with shelly matter by the process of fossilization; and I think this fact is further proved by the manner in which the cavity of the shell is lined with calcareous laminæ like the siphons, as figured in M. Deshayes's plate, tab. 4. f. 8, 9, and also by the form of the end of the tube figured in the same work, tab. 3. f. 17, 18.

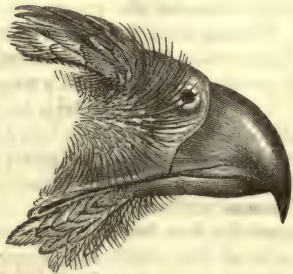
On the Variation of the Form of the Upper Mandible in a Rapacious Bird. By PHILIP LUTLEY SCLATER, M.A.

Mr. J. H. Gurney has called my attention to the great variation in the form of the upper mandible of *Urubitinga uncinata*, as observable in some specimens which form part of his collection. I have seen the same sort of thing in the case of other *Accipitres*, but never carried to such an extent as in the present instance. In one of these birds (fig. 1) the lateral margins of the upper mandible are strongly festooned, and project far down over the edges of the lower. In a second specimen (fig. 2)—apparently of about

Fig. 1.



Fig. 2.



the same age, both being in immature plumage—the commissure is very nearly straight. In other examples there is merely a slight festoon. As the formation of the edges of the upper mandible is much in use as a generic character—rightly enough, I believe, and not generally liable to lead to error—the present abnormal variation seems worthy of notice.—*Proc. Zool. Soc.* March 23, 1858.

On the Metamorphosis of Praniza into Anceus.

In a recent Number (No. 6 of the present Series) we gave a very brief notice of the reported discovery by M. Hesse of Brest, that the *Pranizæ* are the larval forms of *Anceus*. At the meeting of the Academy of Sciences on the 28th of June, 1858, M. Milne-Edwards presented a report upon the memoir of M. Hesse, containing some further information as to the extent of the observations made by the latter. From this it appears that M. Hesse found some *Pranizæ* upon the fins of Gurnards and some other fishes, and kept them alive in sea-water. After they had passed a few days in captivity, he saw them become transformed into *Ancei*. In another series of observations M. Hesse followed the development of the ova deposited by *Ancei*, and saw *Pranizæ* hatched from them. "The fact of the specific identity of the *Pranizæ* and *Ancei*," says M. Milne-Edwards, "appears to us therefore completely established. The *Pranizæ* are *Ancei* in the state of larvæ, just as the tadpole is the young of the Frog, and the silkworm the first state of the *Bombyx*." This memoir of M. Hesse, with another by the same author upon the *Caligidæ* and *Lernæadæ*, will be printed *in extenso* in the 'Mémoires des Savants Etrangers.'—*Comptes Rendus*, June 28, 1858, p. 1258.

On the Power of Dissolving Shells possessed by the Bernard Crab (Pagurus). By Dr. J. E. GRAY, F.R.S. &c.

In a note to my paper "On the Formation and Structure of Shells," in the 'Philosophical Transactions' for 1833, I stated it is probable that some Bernard Crabs have also the faculty of dissolving shells, for it is not unusual to find the long fusiform shells (such as *Fusus fasciolarus* and *turbinella*) which are inhabited by these animals, with the inner lip and great part of the pillar on the inside of the mouth destroyed, so as to render the aperture much larger than usual.

Having continued my observations on these shells, I am convinced that certain species of Bernard Crab (*Pagurus*) have this power, some possessing it to a much greater degree than others.

Lieut. Burnaby lately brought a number of Crustacea to the British Museum from the South Seas, amongst which there were several specimens of *Paguri* in shells, and these shells were more destroyed than any I had before observed. One, a specimen of *Persona tuberosa*, not only had the whole of the thickened rounded inner lip, but the whole of the septa between the whorls up to the apex of the shell also destroyed, so as to convert the shell into a simple conical cavity; and the greater part of the substance of the outer lip was also removed from the inner surface, so as to render the outer part of the shell very thin—indeed so much was removed, that the series of pits on the outer surface, just above the marginal varix of the outer lip, was entirely destroyed, converting the pits into a series of apertures. The other shells inhabited by these Crustacea were similarly destroyed. The internal surface of the shell has the appearance of being ground away by a file or other rough surface.—*Proc. Zool. Soc.* March 9, 1858.

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XVI.—On *Praniza* and *Anceus*, and their Affinity to each other.
By C. SPENCE BATE, F.L.S. &c.

[With two Plates.]

THE small Crustacea known by the names of *Anceus* and *Praniza* have long been objects of interest to naturalists. The peculiarity of their form and our ignorance of their habits have not only induced carcinologists to consider them as forming distinct genera, but even to group them in separate families.

Colonel Montagu described the first specimens in the seventh and eleventh volumes of the Linnæan Transactions, among other marine animals taken on the coast of South Devon. Dr. Leach believed that they might ultimately be found to be but different sexes of the same species, and this has been the opinion of many other naturalists.

There has been a mystery attendant upon their habits also. *Praniza* has frequently been taken associated with parasitic Crustacea: not so *Anceus*. Hence Colonel Montagu, Mr. Westwood, and M. Otto have considered *Praniza* to be a parasite upon certain animals. It has been taken, by Colonel Montagu, attached to the Father Lasher (*Cottus Scorpius*). On the other hand, it has been found quite as frequently, along with *Anceus* and other non-parasitic Crustacea, in the crevices of rocks and in shore-pools, as well as in deeper water. In the first of these positions it has been taken on the clayey shores of Strangford Loch by Mr. Haliday, who, I believe, is among those who hold most strongly the opinion that it is a separate species of animal from *Anceus*, his conclusion being based upon the structure of the oral organs. Here hypotheses have rested, until facts of greater or less importance should assist us in arriving at a correct conclusion.

On the 26th of November, 1856, a paper by M. Hesse of Brest was read by M. Coste before the Academy of Paris, in
Ann. & Mag. N. Hist. Ser. 3. Vol. ii.

which it is stated that *Praniza* and *Anceus* are but two ages of one and the same animal; that, after having lived during a certain time under the form of *Praniza*, it assumes that of *Anceus*, and in this latter stage gives birth to young *Pranizæ*. The reverse of this appears to have been the idea of Mr. A. White, when he prophesied, in his recent 'Manual of the British Crustacea,' "that there is some likelihood that *Anceus* may prove to be one of the stages of *Praniza*."

M. Hesse's statements rest upon no hypothesis. They are the result of facts that he himself has witnessed, drawings of which accompany his memoir. The whole are now being submitted to a commission composed of MM. Duméril, Milne-Edwards, and Coste*.

In studying the smaller forms of Crustacea, I have obtained many specimens of each of the animals in question; and though I have hitherto confined myself to the study of the *Amphipoda*, I am induced not to allow the data I possess upon the question to remain any longer concealed.

Before entering upon a discussion of the subject, it will be desirable to have a clear idea and just appreciation of the forms of the separate parts as well as of the general structure of both animals. I shall therefore commence by an examination of the adult *Praniza*.

The *cephalon* is quadrate. The eyes, sessile and prominent, are situated upon each side of the head. The *antennæ* are four, nearly equal. Posterior to the *cephalon* are two distinct segments, each supporting a pair of legs directed anteriorly. Then follow three membranous segments fused into one large oval division. This, together with the two preceding segments, and one, too insignificant to be observed by unassisted vision, form the *pereion*. It consists of six segments only. So also the *pleon*, which is much narrower than the *pereion*, and laterally carries two pairs of foliaceous appendages upon each of the six segments.

The general outline of the head appears to converge to a point anteriorly. This has universally been the accepted form of the animal,—a form that is due, not to the shape of the *cephalon*, which is, as I before observed, square, but to the shape and position of the *labium* and organs of the mouth.

The *labium* (Pl. VI. fig. 7 d'') in *Praniza* is an important organ. It is large, and projects horizontally forwards. The anterior margin is concave, and considerably narrower than the posterior. From the centre of the anterior edge, after having traversed the inferior surface of the organ, projects a small siphon.

* Since this paper has been in the press, the report confirming M. Hesse's views has been presented to the Academy by M. Milne-Edwards. See *Annals*, 3rd series, No. 8. p. 164.

The *mandibles* (*d*) originate from the inferior base of the *labium* and project horizontally forwards, lying immediately beneath and parallel with that organ; the tips of the former extend beyond the extremity of the siphon. The anterior half of the inner margin of each mandible is strongly denticulated.

The *maxillæ* (*e, f*) originate posteriorly to the mandibles, are lanceolate in form, slightly curved, and serrated upon the inner margin.

The *maxillipedes* (*g*) consist of four or five articulations, from the anterior inner margin of each of which a long lanceolate process is produced.

There is but a single pair of *gnathopoda* (*h*); these consist of six articulations,—the *coxæ* probably being fused, as is the case with all the other limbs, into the body of the animal. The *dactylos* of the *gnathopoda* is developed into a powerfully formed hook, both the limbs being directed horizontally forwards. This pair originates apparently from the ventral surface of the posterior part of the *cephalon*; but close observation, particularly in a lateral aspect, discloses a small segment behind, and distinct from the *cephalon* (Pl. VI. fig. 8 H). It is from this segment that the pair of *gnathopoda* originates.

The two next pairs of legs are homologous with the two anterior pairs of *pereiopoda* in *Amphipoda*. Each is laterally attached to a distinct segment, and directed forwards. It is chiefly upon this fact that Professor Dana has constituted his group *Anisopoda*. In this respect *Anceus* agrees with *Praniza*.

The three posterior pairs of legs are the three posterior *pereiopoda*, and are attached to one inflated membranous segment, the result of a fusion of the three posterior segments of the *pereion*.

The *pleon* is much narrower than the *pereion*. It consists of six distinct segments, each of which is furnished on each side with a pair of ciliated foliaceous appendages attached to a uni-articulate peduncle. The posterior segment terminates in a point.

This description is taken from *Praniza cæruleata*. It is to be regretted that the name should have been adopted from the colour of the animal. I have received them of a bright grass-green from Mr. Loughrin of Polperro; blue, from the crevices in the slate in Plymouth Sound; and dredged them of an ash-grey, as well as transparent and a dirty-white, in five or six fathoms of water in the same locality. There can be no doubt, moreover, as stated by M.-Edwards, that *P. fuscata* of Johnston, which is described to be of a reddish-brown colour, is the same animal.

That we have more than one species is certain. Besides *cæruleata*, two specimens of a different species have been sent to me by Mr. Edwards of Banff. This species, to the eye, differs in

the more continuous and less graceful outline from the anterior part of the head to the posterior part of the *pereion*, the shortness of the *pleon*, and the smallness and more equal size of the *pereiopoda*; and in the less easy to be detected, but not less important facts, that the *mandibles* do not extend beyond the *labium*, and the *gnathopoda* have but four articulations and terminate in a rudimentary form. The powerful hook is wanting. One of this latter species, which I shall name *Edwardsii*, after its finder, who has been a valued correspondent during my researches in this class of animals, was charged with young. It is a remarkable fact, that in the young the organs generally bear a closer resemblance to those of *P. cæruleata* than to those of their own parent species.

In the young the mandibles project beyond the labium. The *gnathopoda* are furnished at the extremity with powerful hooks. The siphon is prominent and well formed. The five conspicuous segments of the *pereion* correspond in their relation to each other, the centre one being the largest, and the posterior and anterior being equal and the smallest: no fusion exists between any of them. On the ventral surface of the *four* posterior segments is pendent a membranous sac. It is the monstrous enlargement of this sac in the development of the animal, fusing into one segment and separating widely apart the three posterior *pereiopoda*, that gives to this animal its most remarkable and peculiar feature.

In an examination of *Anceus* we find some points that assimilate and others that are widely distinct from the structure of *Praniza*. The eyes are sessile and placed anteriorly upon each side of the head. The *cephalon* is quadrate, depressed from the centre to the anterior margin; the lateral edges are raised like walls on each side.

The *antennæ* (Pl. VII. fig. 3 *b, c*) are subequal, placed, as in *Praniza*, at the anterior lateral angles of the *cephalon*, and one immediately above the other.

The *labium* is absent or rudimentary.

The *mandibles* (*d*) are prominent and powerful; they originate at the anterior extremity of the *cephalon*, and extend horizontally in advance of the head.

The *maxillipedes* (*g*) consist of five articulations, a projecting process arising from the basal one.

The *gnathopoda* (*h*) consist of two articulations, one large and the other very small. The large one is straight on the exterior and convex on the interior margin; the latter is ciliated and laps over the corresponding margin of the opposite *gnathopod*. The whole forms a squamiform and efficient operculum to the organs of the mouth.

The succeeding segments are as broad as the *cephalon*.

The three posterior segments of the *pereion* are slightly narrower, and imperfectly fused together.

The *pereiopoda* bear a close general resemblance to those of *Praniza*, though somewhat more tuberculated.

The *pleon* is much narrower than the *pereion*, and consists of six segments, each of which is furnished on each side with a pair of ciliated foliaceous appendages attached to a uni-articulate peduncle. The posterior segment terminates in a point.

Upon comparison, therefore, of *Praniza* with *Anceus*, we find differences as important as those which usually exist between genera or even families. Hence their classification by naturalists into separate genera, as *Anceus* and *Praniza*, each of which has been taken as the type of a particular group or family.

Other observers, knowing the frequent distinction that exists between the forms of the different sexes of the same species, have assumed that the distinction between *Anceus* and *Praniza* is one of sex only. To this idea I had a considerable inclination.

Examination of the details of both animals shows us no distinction that is not reconcilable with this idea. The *mandibles* resemble each other in form and position, and differ only in size and strength. The *labium* is absent in *Anceus*, and developed into a *siphon* in *Praniza*,—a distinction, I am informed by Professor Kinahan, that was first pointed out by Mr. Haliday. But that this may be only a sexual distinction, we may infer from the fact that the males of parasitic Isopods differ in a similar respect from their sedentary females.

I have hitherto been inclined to believe that all *Pranizæ* were females;—that the great membranous enlargement which is separated into four divisions upon the ventral surface was a pouch for the development of the ova, and the homologue of the pouch that is carried upon the ventral surface of the *pereion* in all the Edriophthalmous Crustacea.

There is certainly nothing in the young of *Praniza* from which we could assume that an *Anceus* might not be developed. This appears still more correct when the larva has grown a little, as may be seen in fig. 3. Pl. VI., where the form is intermediate between *Praniza* and *Anceus*.

Recently M. Hesse has astonished us by the statement that *Anceus* is the adult animal, and that *Praniza* is the young;—that he has, if I understand correctly from the short notice in the 'Comptes Rendus*,' witnessed not only the change of the former into the latter, but, moreover, the reproduction of the latter from *Anceus*.

* March 22, 1858, p. 568.

The experience of M. Hesse is quite at variance with my own observations. The larva which I have figured in Pl. VI. fig. 2 is one of about twenty that I obtained from the *Praniza* I have given in fig. 1. It appears therefore that some fallacy must have crept into the researches of M. Hesse, since *Praniza* is evidently an adult animal. The mysterious law governing reproduction under the phase of alternation of generations can scarcely account for the discrepancy, since the young of *Praniza* bear to the parent as close a resemblance as is found usually to exist between the old and young. They differ only in the relative proportion of certain parts; and others, which are not required until the age of puberty, are necessarily in abeyance.

M. Hesse says that *Anceus* bears young. This fact being discovered by him, proves that there are female *Ancei*. This, together with the fact that I have stated relative to *Praniza*, demonstrates the error of M. Hesse's hypothesis, "that *Praniza* is the early stage of *Anceus*," and goes far to establish the foregone conclusions of previous naturalists, that the two animals belong to distinct genera.

M. Hesse says not only that *Anceus* bears young, but that these young are *Praniza*. We know, from experience in observation, that the larvæ of any given tribe of Crustacea are generically similar: as I have previously shown, there is a considerable resemblance between the young of *Praniza* and the adult *Anceus*; so therefore we may infer that the general resemblance of the larva of *Anceus* to the larva of *Praniza* is considerable,—a circumstance that may account for M. Hesse's assumption that the former are *Praniza*.

I think we may, from what is known, deduce the following conclusions:—

That (upon M. Hesse's observation) *Anceus* is an adult animal.

That (upon our own observation) *Praniza* is an adult animal.

That *Praniza* consequently cannot be developed into *Anceus*.

That *Anceus* is a distinct genus from *Praniza*.

That the males of both genera have yet to be discovered.

The males of both *Anceus* and *Praniza* have to be made out; but it is not rash to infer that they may so nearly resemble the females, as to make it a test of considerable difficulty.

I have recorded that in *Praniza Edwardsii* the gnathopoda have an immature character, while in *P. cæruleata* they possess the appearance of an efficient organ. It is not improbable that this may be a sexual distinction in every species of *Praniza*: to this inference I am led by the fact that all the larvæ of *Praniza Edwardsii* possess the powerful hook seen in *P. cæruleata*, while it is absent in the parent. I have elsewhere expressed a conviction that the larvæ of Crustacea possess at an early

stage the rudiments of both sexes,—a circumstance which, if correct, would account for the gnathopoda being different in the larva from the same organs in the adult female. I hope to be enabled to set this point at rest before it is embodied in the work I have in hand.

With regard to *Anceus*, I have as yet no experience to lead me to any conclusion.

There is a mystery in the production of the ova of *Praniza* that would well repay the embryologist for studying. I have before observed that they are occasionally taken transparent, white, ash-grey, green, blue, and red-brown. These varieties of colour *appear* to be dependent upon the progress made in the advancement towards spawning, or in some way connected with the development of the ova.

When the animal is blue, I have observed a double line of ova traversing the length of the enlarged segment, as seen in fig. 4, Pl. VI., and figs. 7, 7", Pl. VII. This I presume to be the ovary or the oviduct previous to the escape of the ova into the incubatory pouch, which they ultimately fill, to the apparent annihilation of the other contents of this part of the animal.

I have watched specimens in a glass, and perceived, after a few days, that the blue mass, which at first appeared to fill and distend the large segment of the *pereion*, gradually diminished, apparently deteriorating. It recedes first from the margin. In so doing, it displayed a series of layers, placed one before the other, lying across the animal. There were indications also of these layers being divided by cross-sections. It is from one so depauperized that fig. 4 in each plate is taken. The ova ultimately fill the pouch, first as seen at fig. 6. Pl. VII., and ultimately as shown in fig. 8, where the embryo has considerably advanced towards completion.

The blue appearance is now changed to a brown,—a circumstance that is due to the reddish pigment-cells which mark the *pereion* of the young animal.

The nervous system is similar to that of other Isopoda. The ganglia of the three posterior fused segments are distinct, and an intermediate branch is given off on each side from the nervous cord, between each ganglion. One cord only appears to be given off on each side of every ganglion except the one preceding the last three of the *pereion*; this appears to give off three upon each side. Those within the *cephalon* I could not distinctly make out; but, without being fused, two ganglia appeared to be brought close together. Possibly the ganglion belonging to the suppressed gnathopoda may be present.

The animal is small, but the nervous system is readily detectable along the ventral surface of the undissected creature.

EXPLANATION OF PLATES.

PLATE VI.

- Fig. 1. *Praniza Edwardsii*: 1 *g*, maxilliped; 1 *h*, gnathopod.
 Fig. 2. Larva of ditto.
 Fig. 3. Ditto, older, of *cæruleata*?
 Fig. 4. *Praniza cæruleata*: 4 *b*, upper antenna; 4 *c*, lower ditto; 4 *f*, maxilla; 4 *g*, maxilliped; 4 *h*, gnathopod.
 Fig. 5. Cephalon and appendages (dorsal surface): *b*, superior antenna; *c*, inferior ditto; *d''*, labium; *h*, gnathopod; 5 *a*, part of the eye enlarged.
 Fig. 6. Labium enlarged (from below): *d''*, siphon; *d*, mandible; *b*, antenna (inferior).
 Fig. 7. Cephalon and appendages (ventral aspect): *a*, eye; *d*, mandible (turned back); *d''*, labium and siphon; *e, f*, maxillæ; *g*, maxilliped; *h*, gnathopod.
 Fig. 7 *d''*. Ditto, lateral view.
 Fig. 8. Lateral view of head and anterior part of pereion.
 Fig. 9. Ditto of pleon and posterior part of pereion.
 Fig. 10. Nervous system.

PLATE VII.

[The four lines at the top of Plate VII. represent the natural sizes of the larva at the time of being hatched, and a little later, of *Anceus maxillaris* and *Praniza cæruleata* respectively.]

- Fig. 1. *Anceus maxillaris*.
 Fig. 2. Cephalon, lateral view.
 Fig. 3. Ditto, seen from below: *b*, upper antenna; *c*, lower ditto; *d, d*, mandibles; *h*, gnathopod; 3 *g*, maxilliped; 3 *h*, gnathopod; *h''*, cilia enlarged.
 Fig. 4. Ventral aspect of body of *Praniza*.
 Fig. 5. Ditto of *Anceus*.
 Fig. 6. Ova of *Praniza* (early stage).
 Fig. 7. Pereion of *Praniza* with ova: 7'', ova of same.
 Fig. 8. Pereion of *Praniza* with ova; 8'', ova of same.

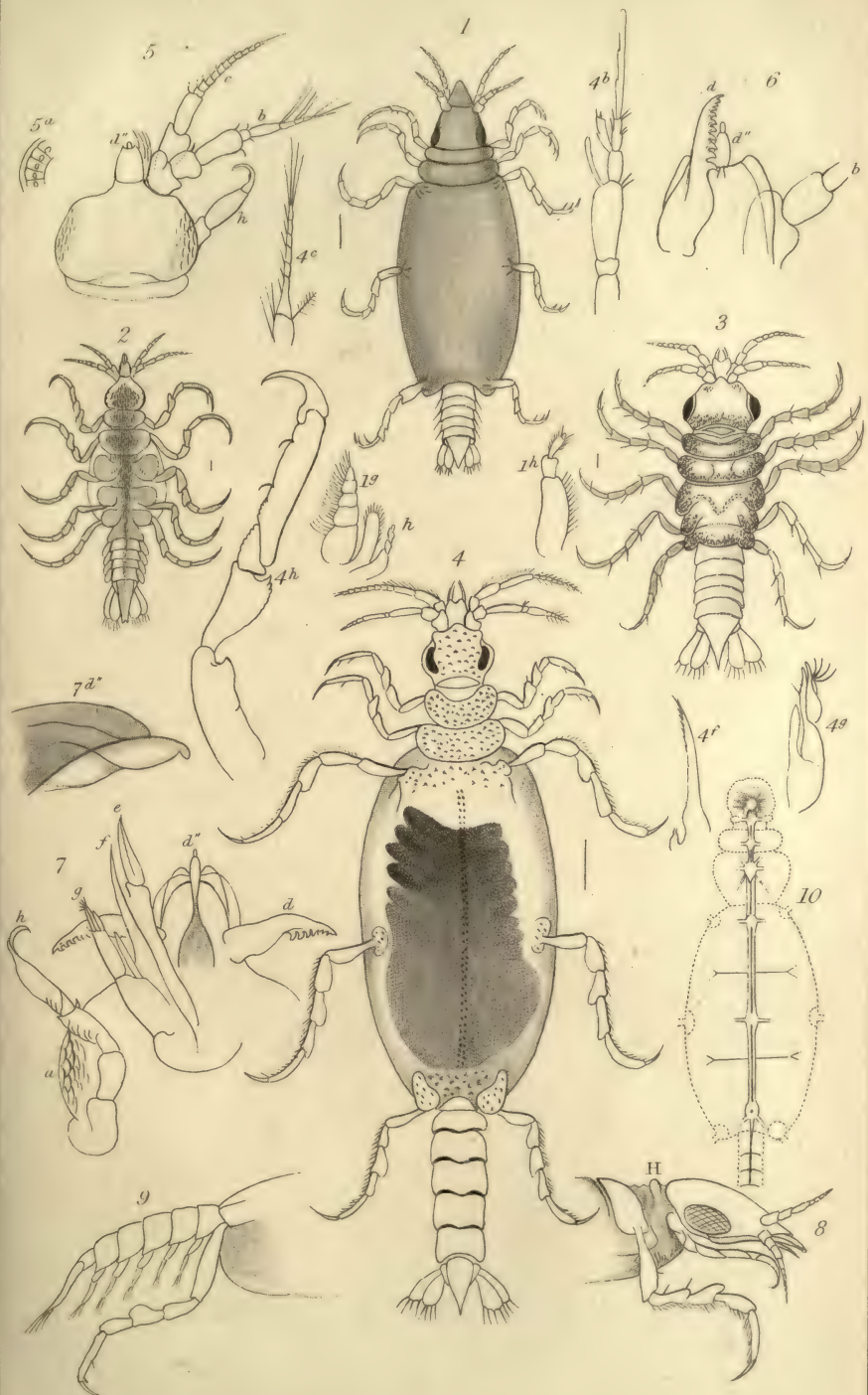
Plymouth, July 20, 1858.

XVII.—Remarks on *Lepas anatifera*, Linn.

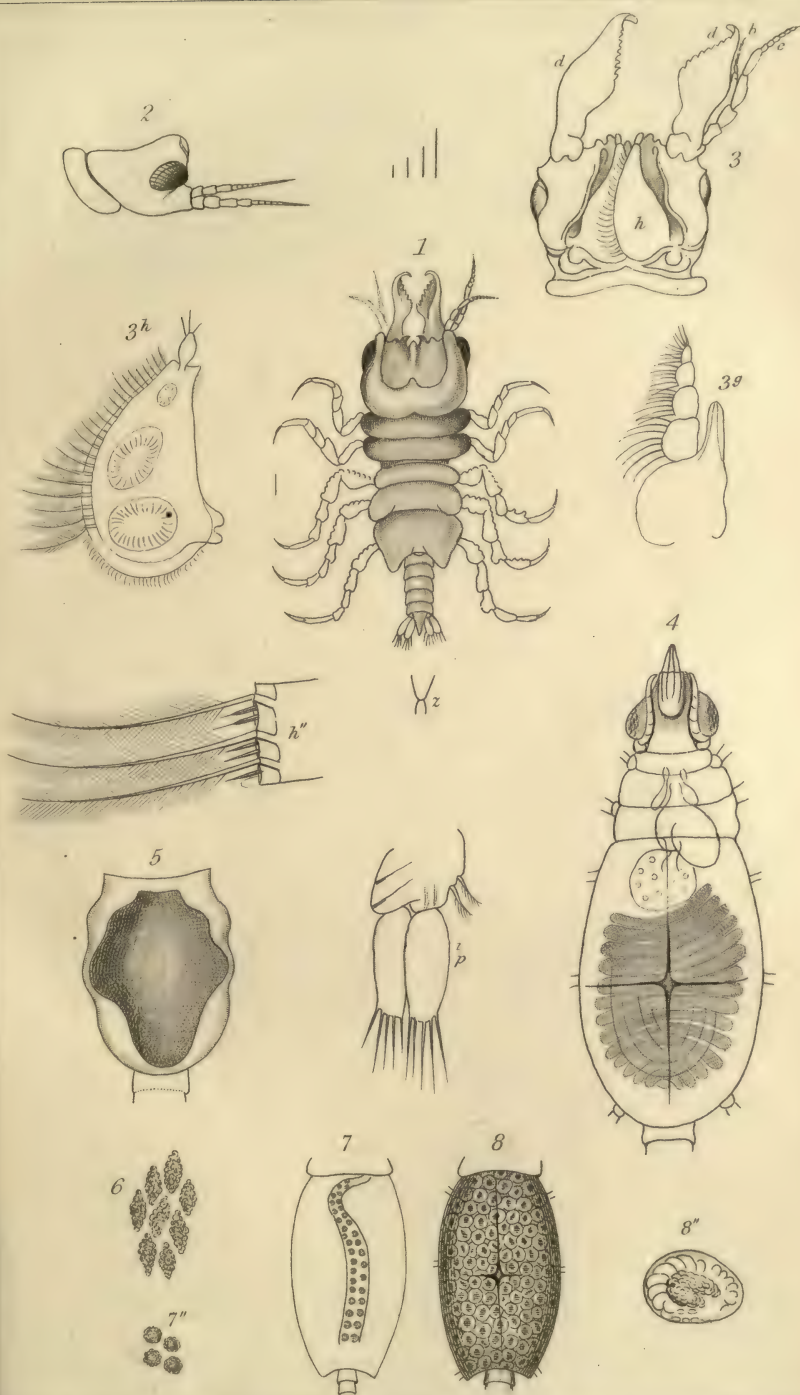
By GEORGE LAWSON, Ph.D.

ON the 9th July, 1858, while the steam-ship 'Dundalk' was passing through Banff Bay, on her passage from Inverness to Granton, the attention of the crew and passengers was attracted by a remarkable object floating in the water, which was at first supposed to be a huge fish. A closer examination proved it to be a squared log of fir-timber, somewhere about thirty feet in length, *completely covered throughout its entire lower surface with a dense crop of barnacles.*

The log was brought to Granton Pier, whence I obtained a supply of specimens for examination. The species is *Lepas*









anatifera, Linn.*, a species which appears to have been much confounded with the equally common *L. Hillii* of Leach, but which is readily known from its allies by the right-hand scutum being furnished internally with a prominent umbonal tooth, while the left one is without any trace of this appendage.

The specimens were densely crowded together over the whole lower surface of the log, and are of variable size, from two to seven or eight inches in total length. The valves are of a pearly white, with a bluish-grey tinge from the underlying corium, their surface marked with faint radiating striæ. The edges of the scuta, &c., are of an orange-colour. The carina is slightly, but obtusely, "barbed." The peduncle is smooth, with encircling wrinkles, and of a white, yellowish, or pale brick-red hue, according to age and size of specimens,—becoming dark, almost black, towards the apical or neck portion, where it unites with the capitulum. The remarkable "filamentary appendages" described in books as occurring at the bases of the first pair of cirri in this genus, without any very special functional office being assigned to them, were found to be present in all the specimens I examined, and their number was constant,—two on each side. Mr. Darwin quotes the following synonyms for this species:—*Anatifa engonata*, Conrad; *A. dentata*, var., Bruguière; *Pentalasmis dentatus*, var., Brown.

During the few days that the log remained on Granton Pier, large quantities of the barnacle were carried away for the purpose of being cooked and used as an article of food. Some foreign sailors, I was told, recognized them as forming a delicacy on which they had feasted on former occasions. Mr. Darwin does not notice the use of any species of *Lepas* for food, but enumerates two species of *Pollicipes* and one of *Balanus* that are so used. I am informed (he says) by Mr. L. Reeve, that *Pollicipes nitella* is eaten on the coast of China; and Ellis states† that this is the case with *P. cornucopia* on the shores of Brittany. It is well known that the gigantic *Balanus psittacus*, on the Chilian coast, is sought after as a delicacy.

The exhibition of the *Lepas* log on Granton Pier soon gave opportunity for observing that the old tradition of the origin of barnacle geese is by no means extinct.

The occurrence of this species in such quantity in a living state on a drift-log in Banff Bay is not without interest; and I have thought a record of the fact might be useful to some readers of the 'Annals.'

Mr. Peach records two instances in which, after gales of wind, this species, of nearly full size, adhering to apparently freshly broken-off *Laminariæ*, has been cast upon the coasts of England

* Darwin, Cirripedia, vol. i. p. 67. tab. 1. fig. 1. † Phil. Trans. 1758.

and Scotland. There is certainly a belief among mariners that it occurs on the shores of the north of Scotland.

Now that attention is being devoted to the phænomena of ocean currents, to an extent commensurate in some measure with the scientific interest and importance of the subject, it is desirable that observers on different parts of our coasts, as well as the captains of ships, should record any facts of interest relative to drift-timber, seeds, and other land productions from a distance, as well as floating Cirripedia, &c., which may be thrown ashore or picked up,—the careful observation of all which, in connexion with concurrent meteorological conditions, is likely to afford useful facts for interpreting many phænomena that are as yet very imperfectly understood.

I could not ascertain any circumstances that served to indicate the original source of the fir log above referred to. Judging from the perfectly fresh appearance of the timber, even close to the surface, and the strong resinous odour which that part exhibited when scraped with a knife, I conclude that the log could not have been long exposed to the action of the sea-water. In fact, the log presented on the surface a cleaner and fresher appearance than the ordinary new timber which we see floated down our rivers. In some parts, however, there were burrows of apparently a small mollusk, of which I could not obtain specimens.

The above circumstances are easily explained if we keep in view the fact, that the Pedunculate Cirripedia develop themselves very rapidly.

Mr. Darwin observes that “all Cirripedia grow rapidly: the yawl of H.M.S. ‘Beagle’ was lowered into the water, at the Galapagos archipelago, on the 15th September, and, after an interval of exactly thirty-three days, was hauled in. I found on her bottom a specimen of *Conchoderma virgata*, with the capitulum and peduncle each half an inch in length, and the former $\frac{7}{10}$ ths in width. This is half the size of the largest specimen I have seen of this species: several other individuals, not half the size of the above, contained numerous ova in their lamellæ, ready to burst forth*.”

The floating habits of many of the Pedunculated Cirripedes necessarily prevent any very definite limits being placed to the geographical range of species. “The Pedunculated Cirripedes extend over the whole world, and most of the individual species have large ranges, more especially, as might have been expected, those attached to floating objects. Of all the *Lepadidæ*, nearly half are attached to floating objects, or to animals which are able to change their positions.” Of those attached to fixed

* Darwin, Cirripedia, vol. i. p. 63.

objects, by far the greater number are limited to tropical seas. A notion seems to prevail that the floating species are also almost entirely natives of the warmer-temperate and tropical regions of the ocean, and that specimens picked up in northern regions are wanderers that have been carried beyond their proper range. It is desirable to ascertain to what extent this is the case.

Edinburgh, July 17, 1858.

XVIII.—*Descriptions of new Ceylon Coleoptera.*

By JOHN NIETNER, Colombo, Ceylon.

[Continued from vol. xx. Ser. 2. p. 375.]

Family CARABIDÆ.

Tribe TRIGONOTOMIDÆ.

THE Trigonotomidæ with an elliptic terminal joint of the palpi are abundantly represented amongst the Ceylon Carabidæ, thus making amends for the want of other tribes of the section to which they belong. I have now before me a great many individuals of different species which I have endeavoured to distribute into genera, after the works of Lacordaire, Dejean, and others of less importance. A single glance almost convinced me that they must belong either to *Abacetus*, *Distrigus*, or *Drimostoma*,—genera closely allied, and whose principal, in fact only essential, distinction would appear to consist in the shape of the mentum-tooth. If it is a well-established fact, as cannot be doubted from the above authors, that this tooth is *pointed* in *Drimostoma*,—*large, rounded, equalling the lateral lobes* in *Abacetus*, and *large and truncated* in *Distrigus*, the species described below could not, as to their genera, be distributed otherwise than I have done,—namely five to *Distrigus* and one to *Drimostoma*. The species which I have drawn to the former genus have a large, more or less square tooth, slightly rounded at the anterior angles. It is impossible to call this tooth *pointed* in any of the five species; they cannot therefore belong to the genus *Drimostoma*; nor can any of them be drawn to *Abacetus*, which genus is, moreover, apparently exclusively African. As to the insect which I have placed in the genus *Drimostoma*, its mentum-tooth is not exactly pointed, but it is altogether narrower than in *Distrigus*, and might well be called “*assez aigue*,” as Dejean describes it. This insect differs, moreover, very materially in general appearance, as well as in its details, from my *Distrigi*; and I feel sure that it belongs to the genus in which I have placed it, although it does not quite agree with Lacordaire’s

description, the labrum being emarginated in front, the second joint of the maxillary palpi exhibiting nothing unusual, &c. As to the species which I have established, I feel very certain that they are new and good ones, as it would appear, from the quotations in Lacordaire, 'Gen. des Col.,' that, since Dejean's descriptions, no new ones of Indian species have been published.

These insects live in the manner of the European Feronidæ, but appear to affect rather damp localities; some of them take freely to their wings, and fly commonly into houses in the evenings during the rainy weather.

58. *Distrigus costatus*, N.

D. nigerrimus, nitidus, subtilissime parce punctulatus, ore pedibusque piceis, tarsis antennisque castaneis, palpis brunneo-testaceis. Long. corp. $4\frac{3}{4}$ lin.

Capite, clypeo fronteque leviter excavatis, hac impressionibus 2 lateralibus semilunaribus profundissimis rugulisque nonnullis transversis; mandibulis fortiter sulcatis; menti dente magno excavato; thorace longitudine parum latiore, breviter obcordato, lateribus rotundato, basin versus angustato, basi truncato medio leviter emarginato, antice lateribus fortiter deflexo, dorso posticeque plano, basi longitudinaliter profunde 2-impresso, inter impressionibus leviter transversim rugoso, ad marginem ant. et post. obsolete sulcolato, dorso rugulis nonnullis transversis subtilibus, linea med. longitud. subtili extremis profundis diviso; elytris profunde striatis, interstitiis fere planis, puncto ad striam 2^m medio obsoleto; *tarsis dorso fortiter 3-costatis*; prosterno plano.

Sub quisquiliis in ripis lacus Colombensis communis.

Apparently closely allied to *D. impressicollis*, Dej. However, if the description given in the 'Spec. Gen.' embraces all the characteristics of this latter species, mine is undoubtedly different from it. Dejean says nothing about the costæ on the back of the tarsi, which are the principal characteristic in my species; nor are such costæ of general occurrence or of so little importance that it could be supposed they had been left unnoticed by Dejean for these reasons. I cannot possibly call the thorax of my *D. costatus* "subquadrate;" it is rounded at the sides, narrowed behind, and cut away at the base. The striæ of the elytra of my species are not punctured in the bottom, as those of the *D. impressicollis* are stated to be. In mentioning the inter-antennal impressions, Dejean would certainly not have overlooked the depression in the centre of the forehead, nor that of the clypeus, which distinguish my insect, had they existed in the one he described. The former is round, the latter transverse. I further fail to discover in my species the "reflet un peu changeant" of the elytra, and that the base of the thorax is

“assez fortement ponctuée et que les points se confondent souvent ensemble ;” nor do I consider the interstices of the elytra “relevés, presque arrondis,” or the head “un peu rétrécie postérieurement ;” the head is of the same breadth from the antennæ to the occiput.

59. *Distrigus submetallicus*, N.

D. supra niger æneo-micans, nitidus ; subtus piceus, pedibus, ore antennisque obscure castaneis, tarsis brunneo-testaceis. Long. corp. 3 lin.

Capite præcedentis, sed fronte haud excavato ; mandibulis strigosis ; menti dente mediocri ; thorace breviter rotundato-obcordato, præcedente lateribus magis rotundato, antice magis deflexo, postice fortius quadrato, hic 3-impresso, impressione media lateralibus minus profunda ad apicem prolongata, inter impressionibus punctato longitudinaliterque ruguloso ; scutello excavato ; elytris striatis, ad striam 2^m ante medium utrinque puncto impresso, interstitiis deplanatis ; tarsis lævibus ; prosterno profunde canaliculato.

Ubi præcedentem specimen singulum m. cepi.

60. *Distrigus rufo-piceus*, N.

D. rufo-piceus, nitidus ; pedibus, thoracis elytrorumque margine testaceis, antennis brunneo-testaceis, mandibulis brunneis. Long. corp. 3 lin.

Capite inter antennis profunde longitud. 2-impresso, fronte medio leviter depresso, labro quadrato-rotundato, mandibulis infra medium sulcatis, menti dente mediocri, excavato, apice subrotundato ; thorace *D. costati*, sed parum brevior, basi 2-impresso, linea media longitud. fere obsoleta, rugulis nonnullis transversis subtilibus ; scutello, elytris pedibusque præcedentis, sed elytris puncto ad striam 2^m infra medium obsoleto ; prosterno leviter canaliculato.

In ripis lacus Colombensis specimen singulum legi.

61. *Distrigus æneus*, N.

D. supra æneus, subtus piceus, pedibus dilutioribus, antennis palpisque rufo-piceis. Long. corp. 2½–3 lin.

Capite ante oculos profunde oblique 2-sulcato, rugulisque nonnullis transversis, clypeo fronteque sæpius leviter depressis, mandibulis leviter sulcatis, menti dente mediocri ; thorace rotundato-obcordato, basi quadrate truncato, 3-impresso, impressione media minus profunda in lineam subtilem ad apicem prolongata, inter impressionibus profunde punctato, antice leviter strigoso, dorso subtiliter transversim ruguloso ; elytris striatis, ad striam 2^m medio distinctius puncto impresso ; prosterno sat fortiter canaliculato.

Prope Colombo in arenis subhumidis et nocte ad lumen communissimus.

62. *Distrigus Dejeani*, N.

D. piceo-niger, subtus sæpius rufo-piceus, nitidus, capite æneomicante, pedibus, elytrorum margine antennisque rufo-piceis, palpis testaceis. Long. corp. vix $2\frac{1}{2}$ lin.

Capite inter antennas 2-impresso, fronte leviter excavato, mandibulis subtiliter sulculatis, mento præcedentis; thorace robustiore, ut in præcedente sculpto et signato, sed antice non strigoso; elytris pedibusque præcedentis, illorum tamen puncto minus distincto; prosterno fere plano.

Cum præcedente communissime occurrit.

63. *Drimostoma Ceylanicum*, N.

D. nigro-piceum, nitidum, pedibus piceis, tarsis, antennis oreque dilutioribus, palpis testaceis. Long. corp. $2\frac{3}{4}$ –3 lin.

Capite ante oculos profunde 2-impresso, labro antice leviter emarginato, mandibulis elongatis, rectis, acutis, lævibus, menti dente sat acuminato, antennis art. 2–4 gradatim longioribus*; thorace obcordato, postice fortius angustato, quadrato, lævi, basi 2-impresso, linea longitud. med. diviso, antice impressione semilunari (impressionibus his omnibus profundioribus); elytris striatis, interstitiis parum elevatis; prosterno sat fortiter longitud. impresso.

In prov. occid. non frequenter occurrit.

64. *Casnonia punctata*, N.

C. supra subtusque (occipite abdomineque exceptis) dense profundeque punctata, brunneo-picea, elytrorum margine maculisque 2 apicalibus longitudinalibus cum margine confluentibus brunneo-testaceis, pedibus flavis, trochanteribus, geniculis tarsisque obscurioribus, ore dilute brunneo, antennarum art. 1^o palporumque art. 2^o basalibus flavis. Long. corp. 3 lin.

Specimina nonnulla mens. Decemb. prope Colombo nocte ad lumen cepi.

Smaller than the *Ophionia cyanocephala*. The head is robust, with two impressions between the antennæ, and a third just above them, somewhat of the shape of an inverted V. Occiput less narrowed than in *O. cyanocephala*, smooth. The anterior part of the head deeply punctured. The labrum is slightly produced in the middle. Thorax much plumper than in *O. cyanocephala*, hardly as long as the head, not much narrower, conic, considerably narrowed and cylindric at the base, densely and deeply punctured, especially at the base. Elytra with the shoulders straighter than in *O. cyanocephala*, impressed with rows of deep punctures growing smaller and shallower towards the apex, with a few small hairs near the

* In the *Distrigi* just described, joints 3 and 4 are subequal.

latter part; in the 3rd and 5th interstices three setigerous punctures, in the 3rd and 4th interstices a longitudinal apical macula, of yellowish colour, coalescent with the margin, which is of the same colour; two shallow impressions on either side, one below the shoulders, the other near the apex. Legs shorter than in *O. cyanocephala*.

65. *Casnonia pilifera*, N.

C. glaberrima, nitidissima (quasi lacca obducta), pilis longis sparsis vestita, nigra, ore (labro excepto) antennisque brunneis, his apicem versus dilutioribus, elytris maculis 2 subapicalibus argenteis, pedibus piceis, femoribus basi albis, trochanteribus obscurioribus, tibiis tarsisque brunnescens. Long. corp. $3\frac{2}{3}$ lin.

Specimina nonnulla cum præcedente cepi.

This elegant species is of the same size as the *O. cyanocephala*, but, with the exception of the elytra and abdomen, which are shorter and plumper, still more slender and graceful. Head large, very narrow and prolonged behind, much more so than in *O. cyanocephala*, with two large shallow impressions between the antennæ, and another small one just above them. Occiput slightly transversely rugose. Thorax very slender, half as broad as the head, of hardly the same length, obconic, constricted below the apex, then gradually increasing in size to below the middle; the base abruptly narrowed, cylindric, and impressed with three deep annuliform wrinkles. Elytra about as long as thorax and occiput together, increasing very sensibly in breadth to below the middle. The apex is much more obliquely cut away than in *O. cyanocephala* or the preceding species. The shoulders are full, and hide the margin; just below them the elytra are deeply excavated, showing, moreover, three deep longitudinal impressions in the bottom of either excavation, and a slight yellowish spot, hardly to be distinguished, at the outer part of it. A round spot of silvery appearance adorns the hind part of either elytron. There are two rows of long thin hairs, placed at considerable distances from each other, on the back of either elytron, and a third just within the margin; the same thin hairs are scattered about the thorax, femora, and elsewhere. The legs are longer and more slender than in *O. cyanocephala*.

The *Ophionia cyanocephala* is not scarce in this part of the island; it affects rather damp, grassy localities, where it mounts upon the stalks of the plants; this agrees with what Helfer has observed of some species in Bengal, but is quite different from the observations Lacordaire has made with regard to the American species of the genus. However, it is much more frequently taken about the light at night. The two species just described

are much scarcer. M. C. A. Dohrn of Stettin writes to me that he has received another species from me (*C. Cypris*, D.), which, however, I do not recollect; it would appear to be smaller than either of the former, black, with white tips to the antennæ.

Tribe FERONIDÆ.

Symphysus, n. g., N.

Corpus robustum, oblongo-ovatum, subdepressum. Caput mediocre postice haud angustatum, oculis mediocribus, sat prominulis, globosis. Mentum semicirculare, profunde emarginatum, dente forti spiniformi, lobis haud brevior, ligulæ connato (hinc n. g. *Symphysus*), profunde excavato. Ligula subcoriacea, invertè trigona, dorso elevato, paraglossis magnis connatis, eam sat longe superantibus, apice cylindricis. Palpi art. 4^o ovato, apice truncato; maxillares art. 3^o elongato. Labrum parvum, profunde angulate emarginatum. Mandibulæ validissimæ, subtrigonæ, porrectæ, una 1-, altera 2-dentata. Antennæ filiformes, humeros parum superante, art. 1^o mediocri, 2^o parvo, 3^o sequenti paulo minore, 4–11^o subæqualibus, 5–11^o depressis. Thorax subquadrato-cordatus, lateribus rotundatus, basi angustatus, quadratus, angulis posticis leviter oblique truncatis. Elytra ovata, parallela, apice rotundata et leviter utrinque sinuata. Pedes mediocres, tibiis ant. leviter dilatatis, profunde emarginatis; intermed. fortiter spinosis; tarsi art. 1^o cylindrico-trigono, 2^o et 3^o trigonis, 4^o obcordato, unguiculis simplicibus. (Mas latet.)

66. *Symphysus unicolor*, N.

S. niger, nitidus, glaber, pedibus oreque piceis. Long. corp. $8\frac{1}{4}$ lin.; lat. 3 lin.

Capite inter antennas 2-foveolato, mandibulis sulcatis; thorace antice haud, postice vix emarginato, hic 2-impresso, linea longitud. media diviso, ad marginem posteriorem longitud., dorso subtiliter transversim ruguloso; scutello leviter excavato; elytris striatis, in striis punctatis, interstitiis vix elevatis, cum thorace anguste marginatis.

Specimen singulum f. prope Colombo mens. Decembr. nocte ad lumen cepi.

This description is made after a single female individual; but I have little doubt that the insect belongs to the numerous tribe to which I have referred it, in which it ought perhaps to be placed near *Eccoptogenius*, Chaud. I am, however, not sure whether the shape of its ligula does not entitle it to a place amongst the *Anchonoderidæ*. I may add to the above description, that the accessory stria of the elytra is present, but that the puncture usually found upon the 3rd interstice is wanting. The general appearance of the insect presents nothing whatever particular; however, upon further inspection, the deeply notched labrum and the strong, porrected mandibles are very striking. The labium appears to me of extraordinary construction: the

mentum is large and of a semicircular shape, deeply emarginated, which renders the lobes heavy, rounded outside, and pointed at the tip. In the bottom of this emargination stands a pointed, spine-like tooth, as long as the lobes. This tooth is deeply excavated or grooved, and is clearly seen to be to its full length soldered together with the basal part of the ligula; probably the entire mentum is in this manner connected with the adjoining part of the ligula, but in the other parts it is not so clearly observable as in the tooth, and I have not dissected the labium. The ligula itself is of a leathery consistence, of the shape of an elongated inverted triangle with an elevated back; the anterior margin is straight, and somewhat prolonged beyond what would be the sides of the triangle. The paraglossæ are of membranaceous texture, very broad, adhering to the sides of the ligula to its full length, taking then a slender cylindric form, and reaching considerably beyond it, being at the same time slightly bent inwards.

Tribe HARPALIDÆ.

Calodromus, n. g., N.

Corpus robustum, ovatum, subconvexum. Caput mediocre, subquadratum, postice haud angustatum; oculis minoribus sat prominulis. Mentum profundius sublunatum emarginatum, edentatum, lobis obtusis. Ligula oblonge quadrata, apicem versus dilatata, apice medio leviter producta, libera, paraglossis robustis eam parum superantibus, apice obtusis. Palpi art. 4^o elliptico, apice leviter truncato. Labrum subtransversum, antice emarginatum, angulis rotundatis. Mandibulæ validæ, una 1-, altera 2-dentata. Antennæ robustæ, thoracis basin attingentes, art. 1^o, 3^o, 11^o et 4-10^o inter se subæqualibus, 1-2^o cylindricis, 3^o basi angustato, 4-11^o ovatis, leviter depressis. Thorax transversus, lateribus leviter rotundatus, basi parum angustatus, quadratus, antice leviter emarginatus. Elytra thorace parum latiora, apice rotundata. Pedes robusti, ant. tibiis apice leviter dilatatis, profunde emarginatis, tarsis art. 1-4^o gradatim minoribus, 1^o subtrigono, 2-4^o transversim trigonis, unguiculis validis, simplicibus, *mas* art. 1-4^o leviter dilatatis, subtus squamulis 2-seriatim munitis; pedes intermed. et post. tibiis fortiter spinosis, tarsis simplicibus.

67. *Calodromus exornatus*, N.

C. glaber, nitidus, supra læte viridis, thoracis margine lato elytrorumque fascia inframarginali testaceis, capite viridi-brunneo, antice brunneo, scutello cum sutura brunneis; subtus brunneus, pedibus testaceis. Long. corp. $4\frac{1}{3}$ - $4\frac{1}{2}$ lin.

Capite inter antennas 2-impresso, thorace capitis quarta parte longitudine, duplo latiore, basi 2-impresso, leviter rugoso-punctato,
Ann. & Mag. N. Hist. Ser. 3. Vol. ii.

linea longitud. media diviso, cum elytris anguste marginatis; his profunde striatis.

Specimina nonnulla mens. Nov. et Decemb. prope Colombo nocte ad lumen cepi.

Very pretty insects, apparently closely allied to the African genus *Bradybanus*, Dej., from which, however, they differ in the structure of the ligula and in other minor points. They are quite of the shape of a *Harpalus*, and I have no doubt that their habits are those of the latter. Joints 4-11 of the antennæ have very much the appearance of grains of rice strung together. The metallic green colour with which the insect is adorned on the back is very rich; on the elytra it forms a pattern of two triangles with their tips downwards, that of the upper one being immersed in the base of the lower one, and the apex of the latter being divided; these triangles are flanked on either side by a broad longitudinal belt of yellowish colour. The margin is again green, with the exception of the apex, which is occupied by the yellowish belt. The thorax is green in the centre and yellowish along the sides. The head is more or less brownish green, lighter in the middle; the mouth is brown.

68. *Zaphium pubescens*, N.

Z. rufo-testaceum, oculis nigris, occipite nigrescente, elytris pubescentibus fuscis maculis 2 subhumeralibus, et 1 apicali communi testaceis ornatis. Long. corp. $3\frac{3}{4}$ lin.

Antennis art. 1^o capitis vix longitudine; labro integro; palpis art. ultimo trigono; menti dente magno, obtuso, profunde canaliculato; thorace elongato-cordato, capitis latitudine, duplo longiore, medio leviter longitudinaliter depresso; elytris subtilissime dense pubescentibus, obsolete striato-impressis, humeris obsoletis.

Specimina nonnulla in prov. occid. nocte ad lumen cepi.

This description does not quite agree with Lacordaire's diagnosis of the genus *Zaphium*; the labrum and the tooth of the mentum are not what they ought to be according to this author. However, Schmidt-Goebel, in his 'Col. Birm.,' has already departed from Lacordaire's formula by describing six species of *Zaphium* with an entire mentum-tooth, which, according to the former author, would make them *Polystichi* rather. The fact is, that this part of the labium appears to be variable. In all other respects the insect agrees with Lacordaire's description of the genus.

The labrum is entire; the first antennal joint is hardly as long as the head, slightly curved, and increasing in thickness towards the tip; the second joint is very small and rounded, the rest are subequal, filiform; the tooth of the mentum is very

large, almost equalling the lobes, entire, and deeply grooved at the apex; the maxillary palpi are porrected; the second joint is as long as the two following together; the fourth, in both the maxillary and labial ones, is triangular or slightly securiform, being obliquely truncated at the tip; the thorax is elongated cordiform, truncated at the base; the back is elevated, divided down the middle by an impression; the commencement of the elevation forms two knobs at the base; the first tarsal joint is as long as the three following together.

[To be continued.]

XIX.—On a new species of *Lardizabala*, and on the Structure of the Seed in that genus. By JOHN MIERS, F.R.S., F.L.S. &c.

THE structure and affinities of the genera of the *Lardizabalaceæ* were scarcely known before the publication of the excellent monograph of M. Decaisne above twenty years ago, when the family was first established. Since that time little has been added to our knowledge of the order, except the interesting remarks of the authors of the 'Flora Indica,' who have described the Asiatic species, and have added a new and remarkable genus, which they have gracefully dedicated to the very eminent botanist before mentioned, the type being the *Decaisnea insignis*, a native of the Himalayas. M. Decaisne considered the family to be intermediate between *Schizandraceæ* and *Berberidaceæ*; and Prof. Lindley indicated its nearer affinity with the *Menispermaceæ*, at the head of which order it had long previously been placed as a distinct tribe by DeCandolle (*Lardizabaleæ*, Prodr. i. 95). In my memoir upon the *Winteraceæ* I have pointed out the intimate relationship existing between those two families.

It has been generally understood that the numerous ovules in the ovaries of the *Lardizabalaceæ* are scattered indiscriminately over the whole internal surface of the cell; but Drs. Hooker and Thomson show that in *Decaisnea* the ovules are confined to two regular lines of placentation, which they notice as an exceptional case, contrary to the condition which has been considered the chief characteristic of the order. In *Lardizabala*, a genus belonging exclusively to Chile, I have found that the ovules, in a similar manner, originate in six distinct parallel parietal placentæ, running from the base to the apex; and in the fruit, the seeds are likewise arranged in as many parietal lines. The distinguished botanists just mentioned also state that in *Decaisnea* the ripe fruit is filled with a cellular pulp, which is developed from the whole surface of the growing wall of the pericarp, thus forming a complete homogeneous mass, without leaving any

cavity; and although this pulp firmly embraces the seeds, they observed no real adhesion except at the hilum, where there is a broad organic attachment between it and the external tunic: vessels originating from all parts of the surface of the pericarp ramify through the pulp, but do not meet in the axis of the fruit. A very similar development exists in *Lardizabala*, where the internal space of the fruit is filled with an edible gelatinous pulp: as the fruit dries, this pulp contracts into a pellicular covering that closely invests the black external tunic of the seeds, and within the substance of which numerous spiral vessels are distributed. It appears to me that this pulp is a secretion originating from the funicular point of attachment of each seed to the placenta, rather than an emanation from the entire surface of the cell; for round the hilar foramen in the seed of *Lardizabala* there exists a light-coloured annular cicatrix, which probably indicates the organic point of connexion of the pulpy envelope with that part of the external tunic, as described in the manner above-mentioned in *Decaisnea*, and which also forms the point of its junction with the placenta; for it will be shown that within a cavity of the external tunic there exists an expansion of the funicular mass, which evidently maintains that connexion through the hilar foramen before alluded to.

There are some peculiarities in the structure of the seed in *Lardizabala* that are worthy of attention. The seeds are ovoid, unequally gibbous, always more or less compressed, somewhat angular by the force of mutual pressure, and straighter upon the face next to the pericarp. The hilum, situated below the middle upon this face, consists of a rather small and somewhat oval aperture, which is filled with a fungous substance that becomes fleshy when moistened, and which is continuous with a mass of similar substance filling a large cavity within the tunic. This outer tunic, usually considered as the testa, is dark-coloured, thin, and somewhat chartaceous; and within it is found an inner coating consisting of two distinct adherent integuments. The albumen forming the enclosed nucleus is somewhat corneous, with a large hollow chamber on the side next the hilum; the two integuments last mentioned closely invest the inner surface of this chamber, as well as the external face of the albumen, but the outer shell is in no way inflected into the cavity. If we cut through a seed longitudinally across the line of the hilum, the albumen in this section appears of a gibbously hippocrepical form, with a large ovoid hollow space towards the centre; the two extremities of this horse-shoe are widely apart, the space in the form of a broad plate being filled with the fungous mass before mentioned. If we now cut through another seed in a transverse direction across

the hilum, we find the hollow space deep and narrow, the albumen appearing in the shape of a more compressed horse-shoe, of which the crura are parallel; and in the vacuity is seen the same fungous substance in the form of a flattened plate, between which and the integuments lining the cavity there exists a very narrow space, showing that it is quite free from them in all parts, except at the periphery of the flattened plate, where it is attached to them by means of a very distinct cord or raphe filled with numerous spiral vessels. This raphe is observed both in the vertical and transverse sections, where it forms a broad hollow tube partaking of the nearly circular shape of the cavity, the inner surface of the tube being lined with a close web of white spiral vessels; it is seen to originate at one of its extremities in the hilar foramen of the outer tunic, and after making nearly an entire circuit, it returns close to its starting-point, where it disappears in the chalaza of the inner integument, over the nidular place of the embryo. The embryo is very small, and is best seen in the longitudinal section, where it is found imbedded in the albumen in the extremity of the lower leg of the horse-shoe, or that nearest the hilar foramen of the outer tunic: it lies somewhat obliquely, with its radicle pointing outwards to a small external prominence of the albumen, and with the cotyledons directed towards the centre of the seed: the radicle is terete, short, obtuse, and of the length and breadth of the cotyledons, which are pointed and much compressed, its whole length being twice its own diameter, and about $\frac{1}{12}$ th of the total length of the seed.

On examining this evidence, we readily discern the nature of these several parts: the inference that the outer tunic, which has hitherto been denominated the testa, is of extraneous origin, and therefore of the nature of an arillus, is supported by four reasons:—1. Because it is not likely that the fungous plate, or large funicular expansion found within the cavity of the seed, could have found its way from the exterior into the hollow space through the small hilar foramen of the outer coating; on the contrary, it is more reasonable to conclude that this outer tunic must have been a subsequent formation after the ovule had become convoluted round that excentrically expanded support. 2. Because, had this tunic been the testa, that is to say, a simple development of the primine of the ovule, it would have exhibited some trace of its organic connexion with the other integuments, especially about the region of the chalaza, and would have partaken of the same form, and have been drawn along with them into the cavity. 3. Because this outer tunic is not only completely free from all contact with the raphe, but is far remote from and exterior to it, and therefore it must necessarily have been of a

growth posterior to the curvature of the ovule. 4. Because the integument resulting from the growth of the primine is indicated beyond all doubt by the presence of the cord of the raphe within its substance: it is the more fleshy and exterior of the two integuments which immediately invest the albumen, following it in its excentric curvature, and adhering along the line of the raphe to the peripheral margin of the funicular plate. It would certainly be very incorrect to call this fleshy coating a *testa*: indeed it was for a similar reason that I proposed for the analogous coating in *Clusia* and *Magnolia* the term "arilline," in order to distinguish it from another more internal *testaceous* tunic, which is destitute of vessels of any kind. In fine, any one who will take the trouble to reflect on the consecutive changes that must take place in the development of the seed, and will keep his attention fixed upon the continuity and movement of the coats of the ovule during their excentric development and subsequent growth, must perceive how absolutely impossible it is that the external shell, circumstanced as we find it in this instance, can have derived its origin from the mere increment of the primine.

If we examine this external shell, we find it to be a thin, black, chartaceous or coriaceous entire crust, easily separable from the rest of the seed, owing to the deposition between it and the proper seminal integuments of a quantity of loose cellular tissue, mixed with coloured glands, which adhere to one as well as the other, and give to both a furfuraceous appearance. The coating which immediately invests the entire surface of the albumen in all its curvatures is composed of two distinct tunics, which, though adhering together, are separable. The outer one is soft, opaque, and somewhat fleshy, containing numerous distinct cells, apparently filled with oily matter; it is much thicker around the region of the large hollow raphe: the inner integument is thin and membranaceous, and closely invests the albumen: both are also thickened around the chalazal point, which is situated in the lower part of the cavity near the site of the embryo.

It is said that in some of the *Lardizabalaceæ* (*Akebia* and *Holboellia*) the ovules and seeds are partly imbedded in the fleshy walls of the pericarp; but in *Lardizabala* the reverse of this takes place; for here there is a protrusion of a part of the placenta, forming an expanded funicular support, about which the ovule bends itself, and becomes peltately convex around it,—the whole, as I have above shown, becoming subsequently enveloped by a complete arillus emanating probably from a growth of the placenta, or of its funicular extension. A metamorphosis of an analogous kind, that is to say, an excentric replicature of the ovule round

its funicular support, occurs in the seeds of the tribes *Heterocliniæ* and *Anomospermeæ* of the *Menispermaceæ*, only that in these cases there is no extraneous growth of any enveloping arillæform tunic, such as we find in *Lardizabala*: in the former cases, where the carpels are always unilocular and uniovular, and where the growth of the pericarp is constantly upon its dorsal face, while that of the ventral face is more or less stationary, it is easy to conceive how the ovule in its growth partakes of a similar kind of increment, and becomes moulded round the stationary fulcrum of its placentary attachment. But in *Lardizabala*, where the ovaries are multiovular, the partial protrusion of the placenta is not accompanied by an expansion of the walls of the pericarp. Something more analogous, however, occurs in the *Myrsinaceæ*, where the ovules often become moulded round the globular free placenta, and an arillus, in the shape of an inflated entire membranaceous sac, generated from the root of the placenta, encloses the seed together with its support*.

There is, however, a close analogy in the structure of the seed of *Lardizabala* with that of the *Winteraceæ* and *Canellaceæ*, if we except the circumstance of the deep cavity in the albumen, which does not occur in the two latter families. We find in all these cases a correlative, peculiar outer crustaceous shell; in the next place we see the same corresponding intervening layers of loosely aggregated oleiferous cells; then a similar fleshy tunic enclosing the cord of the raphe, and a still inner integument investing the albumen,—all bearing a striking analogy to the structure I have described in *Illicium*†. This structure shows the very close affinity that exists between the families last mentioned and the *Lardizabalaceæ*; and in discussing the question of these affinities with other orders of the *Polycarpicæ*, I have already suggested the place that the *Lardizabalaceæ* should occupy, relatively to them, in the system‡.

Ruiz and Pavon, who founded the genus *Lardizabala*, mention (Syst. i. 286) two species, both natives of Chile, the one with biternate oblong leaflets unequal at their base, the other with triternate ovate leaflets. DeCandolle (Syst. i. 512) amplified these brief characters by fuller details founded on his observation of dried specimens, adding at the same time the feature of the peculiar petiolar leaflets, which he termed bracts, and which he described as being round and cordate in the former case, and oblong in the other: he observed respecting the latter, that he found the leaves always biternate, as in the other species, not triternate, as mentioned by Ruiz and Pavon. *L. 3-ternata*

* I will at some future time describe the observations I have made on this singular structure.

† *Ante*, p. 112.

‡ *Ante*, p. 36.

was subsequently figured in Delessert's 'Icones,' i. 24. tab. 91, where the leaves are all divided biternately, and the leaflets are represented sometimes inequilateral at base, or partially lobed and mucronate, more or less regularly oblong or ovate, and sub-obtuse or acute. We find, moreover, in the same specimen the petiolar leaflets either cordate or rounded at base, orbicular or ovate, entire or denticulated. I cannot, therefore, perceive any permanent characters corresponding with the two species above-mentioned, and certainly all the specimens I have seen are referable to one species. From the marked manner in which some of the leaflets in *L. biternata* are lobed, it is not unreasonable to suppose that the leaflets may sometimes become further subdivided; but that must be considered as a very exceptional feature. The specimens grown in this country, from which Sir Wm. Hooker made his drawing in Bot. Mag. tab. 4500, bear a rather different aspect, with the leaves somewhat modified in form and texture, from those of native specimens; but that probably is the result of garden cultivation. The plant there described was brought from Concepcion, where it is stated to grow abundantly, and is no doubt identical with the specimens in our herbaria collected in the same neighbourhood.

The small leaflets at the base of the petiole have always been considered as bracts, but they appear to me to partake more of the character of stipulary leaves, for the following reasons:—The peduncle, both of the male and female inflorescence, springs out of the middle of a bud-like verticil of small, erect, squamaceous, hairy bracts, similar in size and shape to those found at the base of the pedicels; this cluster of bracts grows out of the middle of a conspicuous gland-like prominence, seated on the stem, a little above the petiole; and it is from the margin of this prominence that these leaflets emanate: this difference in the place of their origin shows that they should be considered as stipules rather than bracts. They occur both in the floriferous and barren axils, and therefore appear to have nothing to do with the inflorescence; the real bracts are always hairy, while these leaflets are smooth and veined, with a texture exactly resembling that of the leaves. I have occasionally seen a verticil of three of these leaflets at the base of a petiole.

During my residence at Concon, about twenty miles from Valparaiso, now thirty-five years ago, I found growing in its neighbourhood a species of *Lardizabala* in flower and in fruit, specimens of which I still possess. Concluding it to be a plant well known and described, I did not then bestow any particular attention upon it; and it was only by comparison with other specimens in different herbaria, after my return to England above twenty years afterwards, that I found it to differ essen-

tially from *L. biternata*. I do not remember to have seen the male flower, at least I have no fragment or note of it: the flowers in my specimen are female, with sterile stamens, and they appear to me larger than in the other species. In the ordinary species the leaves, as before stated, are always biternate, or ternarily divided into nine leaflets, the lateral ones being inequilateral and sessile, generally very glabrous and polished; all the leaflets are more or less acuminate at base, and often at their summit, are at least twice as long as broad, triplinerved, the lateral nervures springing at some distance from the petiole, are thicker in texture, opaque and somewhat coriaceous, while the primary and secondary petioles are longer in proportion. On the other hand, in my plant the leaves are simply trifoliate or divided into only three leaflets, as in *Boquila*; the leaflets are much larger in size, nearly as broad as long, conspicuously cordate and broadly truncated at base and obtuse at their summit, with a terminal mucro; they are all equilateral, quintuplinerved, the nervures originating at the base; they are very reticulated, much thinner in texture, more transparent, and are deeply sinuated on the margin, the nervures in each salient angle (of which there are six or eight on each side) terminating in a long cuspidate excurrent point: the lateral leaflets are both petiolulated; the main petiole and three petiolets are comparatively shorter, and they, as well as the nerves and veins beneath, are all pubescent. In another specimen gathered at the same spot, and accompanying the fruit, the leaves are much smaller, also simply 3-foliate, the leaflets being more regularly obovate, slightly cordate, very opaque, coriaceous, quite smooth, with thickened margins, which are almost entire or finely crenulated; in other respects it corresponds with the above-mentioned specimen, and is evidently taken from the end of a branch, as its stem is thin and very twining.

In *L. biternata* the stipulary leaves are large, orbicular, and sessile; in my plant only one remains, which is very small, linear, and attenuated at its base. The fruit is similar in size and shape to that of *L. biternata*, as figured in the Prodrômus of the 'Flora Peruviana.' The plant I have described is known at Concon as the Coguil, being the same name as that given in Concepcion and the southern provinces of Chile to the plant of Ruiz and Pavon. 'Coguil' is properly the name of its edible fruit, 'Coguil-boqui' that of the plant, the word 'boqui' being applied alike to all scandent shrubs: the names attributed to it of 'Aguilboquil' and 'Guilboquil' by Dombey and La Prouse are certainly typical errors. In most botanical works, *L. tri-ternata* is said to be a native of Peru, at Arauco; but this is a mistake common to most of the specimens collected in Chile by

Dombey. Arauco is a province bordering on that of Concepcion, and separated from it by the river Biobio.

The following is offered as an amended character of the genus:—

LARDIZABALA, R. & P.—Flores polygamo-dioici. Masc. *Sepala* 6, alternatim biseriata, carnosula, exteriora ovata, æstivatione valvata, interiora angustiora, spathulata, acuminata. *Petala* 6, biseriata, oblongo- vel lineari-lanceolata, acutiuscula, exteriora paullo latiora. *Stamina* 6; *filamenta* in tubum monadelphum coalita; *antheræ* extrorsæ, adnatæ, 2-loculares, connectivo breviter apiculatæ. *Ovaria* 3, rudimentaria, plus minusve attenuata. Fem. *Sepala* 6, biseriata, crassiuscula, campanulatim expansa, exteriora oblonga, versus basin attenuata, concava, interiora alternantia angustiora, imo spathulata. *Petala* 6, sepalis triplo breviora, biseriatim alterna, lineari-lanceolata, utrinque attenuata. *Stamina* 6, libera, hypogyna, gynophoro brevi inserta, petalis dimidio breviora; *filamenta* teretiuscula; *antheræ* eorundem longitudine oblongæ, 2-loculares, connectivo apiculatæ, effætæ. *Ovaria* 3*, teretia, cylindrica, medio extus gibbosa, unilocularia: *ovula* numerosissima, ad placentas 6 longitudinaliter, parietales prominentes horizontaliter affixa, campylotropa. *Stylus* brevis, obtusus, ovario continuus. *Stigma* sessile, glandulosum. *Bacca* 3, majusculæ, cylindricæ, torulosæ, stylo apiculatæ, polyspermæ. *Semina* subovata, gibba, compressa, fusca, in pulpam mucilagineam nidulantia, *hilo* infra medium marginali, parvulo, foramine pertuso: *tunica externa* testacea, fragilis; *integumenta propria* dupla, subadhærentia (exteriori subcarnoso raphigeri, interiori submembranaceo), albumen profundissime excavatum arcte vestientia, et circum *podospermium* magnum internum fungosum compresso-ovatum *raphide* tubuloso annulari cinctum configurata: *albumen* huic modo hippocrepice et profunde excavatum, acetabuliforme, magnum, carnosum: *embryo* marginem versus inferiorem acetabuli oblique inclusus, parvus, subteres, *radicula* cylindrica, infera, *cotyledonibus* compressis centripetis æquilonga et æquilata.

Frutices Chilenses *scandentes*, foliis *alternis*, *ternatis vel biter-natis*, *petiolatis*, foliolis *integris*, *vel sinuato-dentatis*, *coriaceis*, *nitidis*, *glabris*, *vel parce pubescentibus*, petiolo *refracto*, imo stipulis *foliaceis*, sæpe *rotundatis et majusculis donato*; pedunculo *glabro e gemma squamiformi axillari orto*, in masculis *phurifloro*, floribus *breviter pedicellatis*, *racemosis*, *bracteolatis*,

* Interdum 6 secundum DeCandolle, Syst. i. 512, sed dubia.

bracteolis acutis, ciliolatis; in fœmineis unifloro, flore majori ebracteato; floribus omnibus purpureis.

1. *Lardizabala biternata*, R. & P. *L. triternata*, R. & P. *Prodr. Fl. Peruv.* 143. tab. 37; *Syst.* i. 286; *DC. Syst.* i. 512; *Prodr.* i. 95; *Delessert, Icones*, i. tab. 91; *Decaisne, Archiv. Mus.* i. 187. tab. 11; *Hooker, Bot. Mag.* tab. 4501.—Chile (Concepcion et Quillota).
2. *Lardizabala sylvicola*, nov. sp. ♀;—ramulis volubilibus, striatis, glabris; foliis 3-foliolatis, foliolis basi æqualibus, ample ovatis, late truncatis et subcordatis, obtusis, submembranaceis, margine cartilagineo, hinc inæqualiter sinuatis, angulis cuspidatis, 5-nerviis, valde reticulatis, omnibus petiolulatis, petiolulis lateralibus petiolo subæquilongis, intermedio 2-plo longiori, omnibus summo et imo incrassatis nervisque pilosulis, petiolo e basi subito refracto; stipulis axillaribus parvis, linearispathulatis, glabris, venosis, mucronato-denticulatis; foliis terminalibus multo minoribus, glaberrimis, coriaceis, fere integris, margine cartilagineo crenulatis; floribus speciosis, violaceis, axillaribus, solitariis, pedunculo elongato, summo incrassato, e fasciculo bractearum orto, et paullo supra basin bractea unica donato, bracteis parvulis, acutis, margine ciliatis; sepalis amplis in campanulam dispositis; fructibus magnis, toruloso-cylindricis, edulibus.—Chile (apud Concon).

I found this plant at Concon, midway between Valparaiso and Quillota, in a wood that surrounds a small valley well sheltered by hills, called "Potrero del Peral." The short portion of the stem of the branchlet in my specimen is of the thickness of a goose-quill, somewhat flattened, and probably of a first year's growth, as it has a pithy medulla; the petiole, suddenly refracted backwards, is about 9 lines long, and much thickened at its base; the two lateral petiolets are 7 lines long, while the intermediate one measures 18 lines; the terminal leaflet is 3 inches long, and 3 inches wide at its broadest part, whence it is somewhat narrower towards the summit, which is round and emarginated, with a mucronate point; the lateral leaflets are $2\frac{1}{2}$ inches long and $2\frac{1}{4}$ inches broad; the stipules are minute, compared with those of the other species, and instead of being orbicular, cordate, and sessile, are linear and tapering to a small point at base; they are 3 lines long, barely a line broad, strongly reticulated, with a mucronately dentate border. The peduncle is $1\frac{1}{2}$ inch long, somewhat slender below, and thickened towards its summit; about half an inch above its base it has a small, single, acute bract, which has ciliated margins, and it bears at its base a fascicle of similar bracts which rises out of a warty

prominence situated just above the petiole, and it is upon the margin of this prominence that the stipules originate. The flower is expanded into a broad bell, with a reflected margin, which is 1 to $1\frac{1}{4}$ inch in diameter; the three outer sepals are 10 lines long and 5 lines broad, somewhat obtuse at their summit, and narrower toward the base; the three inner sepals are 9 lines long, 3 lines broad, more acute at the summit, and still narrower at base. The six petals are shorter, almost linear, obtusely acuminate at the summit, attenuated at the base, and nearly equal in size, 5 lines long and 1 line broad in the widest part; the stamens are 3 lines long, the filaments being slender below, swelling above into a thick, fleshy, fusiform connective, in which the two sterile anther-cells are extrorsely imbedded, the connective terminating in a curved excurrent point. The three ovaries are 7 lines long, $1\frac{1}{4}$ line in diameter, 1-locular, with six projecting parietal parallel placentæ, each bearing a number of minute, almost peltate ovules, supported upon a short prominent funicle, with a horizontal or sub-ascending direction. The fruit is cylindrical, torulose, six-grooved, apiculated by the persistent style, $1\frac{3}{4}$ inch long, 1 inch in diameter; the pericarp is thin and coriaceous, extremely friable and of granular texture when dry; it is unilocular, and filled with a mucilaginous pulp, of a pleasant, sweet, and subacid taste, which dries into a thin epidermis that invests the seeds, and leaves a vacuity in the centre, without the vestige of any division. This is contrary to the statement of Ruiz and Pavon and other authors, who describe the fruit of *L. biternata* as being 6- or 8-locular. The seeds are very numerous, ovate, somewhat compressed, often subangular by mutual pressure, and are attached to the wall of the pericarp in a somewhat horizontal position by a small hilum; they are arranged in six very distinct series; they are about 5 lines long, 4 lines broad from the hilum to the more convex side, and 3 lines broad in the other transverse direction. Their structure has been already fully described*.

XX.—*Characters and Descriptions of some new British Sea-Anemones.* By PHILIP H. GOSSE, F.R.S.

Fam. Sagartiadæ.

Genus PHELLIA (mihi).

Column pillar-like in expansion; margin tentaculate, without parapet or fosse. Surface smooth, pierced with loop-holes, partly

* A drawing of this species, with full details of the structure of its flower and seeds, is given in the 'Contributions to Botany,' plate 28.

clothed with a tough epidermis, rough externally, firmly adherent to the skin. Name from *φελλὸς*, the cork-tree; also its bark.

Sp. 1. *Phellia mureocincta* (mihi). Epidermis free and tube-like at the upper part; its surface not warted.

General Description.—FORM. Base adherent to rocks, slightly exceeding column.

Column cylindrical, pillar-like when expanded, slightly grooved longitudinally, smooth, but partly clothed with a dense, rough, membranous skin, which is firmly adherent from the base about halfway up, but there becomes free, forming a loose firm sheath or tube, from which the animal protrudes its fore parts in extension, and into which it retires, at will, more or less completely. Surface of epidermis rough, but not warted. Height, in full extension, double the diameter.

Disk a deep cup, bounded by the thick feet of the inner tentacles.

Tentacles twenty-four, in two rows, twelve in each; those of the first row twice as large as the others, with which they alternate: variable in form, sometimes strongly conical, stout at the foot, and pointed; at other times nearly cylindrical and obtuse: they have a tendency to assume a knotted appearance: they are generally carried hanging over the margin with a double curve, like the branches of a chandelier; but sometimes those of the inner row stand erect.

Mouth not raised on a cone.

Acontia (not observed).

COLOUR. Column: exposed portion having a mealy appearance produced by a number of whitish longitudinal lines and dashes, more or less speckled and interrupted by the ground-colour, which is pellucid yellowish grey. Of these lines, twelve are broader, and between these are about four slender lines in each interspace. The margin becomes deep buff, producing a depression of that hue, when in the button-state.

Epidermis pale buff, studded with dirty foreign matters.

Disk dull buff, marked with a white star, which is formed by a forked line proceeding from the front of each primary tentacle towards the mouth. A broad white gonidial band on each side.

Tentacles dark brown, pellucid, crossed by three narrow remote rings of white. Where the foot of the tentacle unites with the disk, its radius has a white patch, succeeded by two parallel, longitudinal, black dashes.

Mouth rich buff.

SIZE. Diameter of column one-eighth of an inch; height one-sixth; expanse of flower one-sixth.

LOCALITY. Overhanging rocks and sides of caverns near low-water mark, around Torquay.

SPECIFIC NAME. From the manner in which the edge of the epidermis encircles the summit of the animal when contracted, as if protected by a wall.

Sp. 2. *Phellia gausapata* (mihi). Epidermis firmly adherent throughout; warted.

General Description.—**FORM.** (My observations on this species are as yet very imperfect, and insufficient for a proper diagnosis; my specimen having never expanded since it came into my possession, I have never seen its disk or tentacles.) Surface of column smooth, but by contraction becoming coarsely corrugated, so as to present large irregularly rounded knobs or warts. To this the epidermis is firmly adherent throughout, having no free margin; and being modelled on it, it is covered with coarse warts or bosses.

Acontia protruded from basal region of column, on irritation.

COLOUR. Yellowish brown.

SIZE. Diameter of column half an inch; height three-fourths.

LOCALITY. A rock on the coast of Caithness, whence it was obtained and sent to me by Mr. C. W. Peach.

SPECIFIC NAME. From the *gausape*, or rough frieze coat, which the Roman soldiers wore in cold weather.

Fam. Bunodidæ.

Genus BUNODES.

Sp. 3. *Bunodes coronata* (mihi). Warts in lines, and irregularly scattered, subequal, small: body scarlet.

General Description.—**FORM.** Base adherent to shells, scarcely exceeding column: its outline often irregularly lobulate.

Column cylindrical in expansion, much higher than wide: covered on the upper two-thirds with moderately numerous small warts, neither perforate nor excavate; they are arranged in twelve longitudinal rows, with irregularly scattered ones between. Skin between the warts smooth, and when distended having a satiny lustre. Whole column invested with a thin drab epidermis, deciduous in ragged shreds, but adhering pretty firmly. A distinct parapet, with a smooth sharp edge, but no appreciable fosse.

Disk circular, flat, but often protruded so as to be convex, or to form a low cone; radii distinct.

Tentacles in four rows, of which the first contains 12; the second, 12; the third, 24; the fourth, 48; = 96. They are submarginal, the first row springing at about three-quarter radius; they are shorter than radius, diminishing outwardly, conical, subacute.

Mouth large, protrusile: lip sharp: throat evertile, coarsely furrowed.

COLOUR. Column a rich orange, or orange-scarlet, with the warts either paler or darker than the ground-colour. Edge of parapet cream-white, immediately below which the margin is marked alternately with square patches of dark purplish chocolate, and narrower spaces of whitish (twelve marks of each colour in adults, six of each in young); these, from the fine contrasts of colour, when the button is not quite closed, have a very striking and characteristic effect, as if the animal were surmounted by an elegant coronet. Hence I have selected the *nomen triviale*.

Disk red, varying from pellucid scarlet to a reddish chocolate; each radius bearing a longitudinal central streak of white, which does not reach either tentacle or lip, and bounded by a very fine white line on each side; thus is produced a pattern of fine radiating lines of white on red. Sometimes the lines are irregularly blotched and dilated, with ragged edges.

Tentacles pellucid, nearly colourless, crossed by three dim subopake white bars, of which the middle one is most distinct; near the base are two chocolate bars, generally divided by a central longitudinal line of pellucid white, giving the appearance of four dark spots set in square. Sometimes one bar is nearly or quite obliterated.

Lip whitish. Throat rich orange-scarlet; the furrows darker than the ridges.

SIZE. Diameter of column in button, one and a quarter inch; height two inches; expanse of flower one inch.

LOCALITY. Off Berry Head, Devon; in twenty fathoms. Several specimens dredged, adhering to the shells of living *Turritella terebra*.

A very fine and showy species.

Fam. Ilyanthidæ.

Genus HALCAMPÆ.

Sp. 4. *Halcampa microps* (mihi). Tentacles papillary, without markings.

General Description.—**FORM.** Column cylindrical; 8-inverted, the tegumental insertions of the septa being the boundaries of the swellings; hinder extremity inflatable, protrusile, adhesive: skin minutely granular, enveloped in a thin mucus which entangles foreign matters; ordinarily covered with minute, close-set, transverse wrinkles.

Disk the rounded anterior extremity of the column, around

which the tentacles are planted in two contiguous circles (though those of each row are remote *inter se*). Sometimes this rounded form is not observed, and then the disk is flat.

Tentacles in two rows; the first of eight, about .014 inch long, and .0045 inch in medium diameter; the second also of eight, marginal, remote, alternate with the former, papilliform, their length not exceeding their diameter, or .005 inch. When expanded, those of the first row either stand erect, or arch slightly outward: their movements are rather sudden; their form quite cylindrical, with round ends; their walls thick, apparently imperforate; a few cnidæ scattered in their substance.

Mouth elevated on a small abrupt papilla.

COLOUR. Pellucid yellowish white, positive in the ratio of opacity of the parts; without markings.

SIZE. Column when moderately extended about .025 inch in diameter, to a point about halfway down its length; diameter of posterior inflation at the same time, .065 inch. Total length in this condition .3 inch. *The smallest Anemone known.*

LOCALITY and HABITS. I found it in much eroded limestone from a cavern at Oddicombe, Devon, associated with *Edwardsia carnea*, in June 1858. Having chiselled off many fragments of the rock, I put them into glass jars of sea-water; and in a day or two found *Halcampa microps* crawling up the side of the jar, adhering by its inflated skin. In the course of a day or two more, another and another appeared, until five or six had come under my notice, most of them adhering to the glass. They were active and locomotive, moving along the surface with ease and comparative quickness (at least ten times their length in a night), adhering by any part of the hinder moiety of the column. Very frequently they threw the anterior portion suddenly round, like an irritated caterpillar; and almost continually constrictions were passing down in succession from head to tail.

SPECIFIC NAME. From μικρὸς, small, and ὤψ, the face.

XXI.—Description of a Coleopterous Insect from the Canary Islands. By T. VERNON WOLLASTON, M.A., F.L.S.

Fam. ELATERIDÆ.

Genus COPTOSTETHUS?, Woll.

Coptostethus? canariensis.

C. elongato-oblongus nigro-brunneus dense cinereo-villosus, prothorace magno valde convexo subtilissime et densissime punctulato, in medio lato necnon ad latera rotundato, elytris profunde

crenato-striatis, plus minas (præsertim circa humeros) dilutioribus, antennis, palpis pedibusque testaceis.

Variat immaturus colore fere testaceo.

Long. corp. lin. $2\frac{1}{3}$ – $3\frac{1}{3}$.

Habitat in insulis Canariensibus sub pedibus truncisque arborum prolapsis, hinc inde haud infrequens.

C. elongate-oblong, blackish brown (when immature, pale), and more or less densely clothed with a cinereous pile. *Prothorax* most closely and minutely punctulated all over; very large; exceedingly convex on the disk; widest about the middle, and with the sides regularly rounded; with the hinder angles produced and acuminate; and with the extreme front margin more or less rufescent. *Elytra* more or less diluted in colouring, —especially about the shoulders, which are sometimes almost rufescent; rounded at the sides (being widest about the middle); and regularly and deeply crenate-striated. *Antennæ, palpi* and *legs* testaceous.

The present beetle I conceive to be identical generically with the Porto-Santan *Coptostethus femoratus* (Ins. Mad. 240. tab. iv. f. 8); and it is the only member of the *Elateridæ* which I have been able to detect during a six months' research in the Canary Islands. It differs slightly, however, even in its *structural* characters, from that insect, and it is just possible therefore that it may prove eventually to be the type of a separate, though closely allied, genus; but I defer the consideration of its affinities until a future opportunity (when I shall have had leisure for dissecting the parts of its mouth), contenting myself now with simply securing the *species*, which I believe to be unquestionably new. Should it prove to be a true *Coptostethus*, it will be of the greatest interest geographically, as establishing a powerful connecting link (like many others hereafter to be noticed) between the Madeiran and Canarian groups; for whilst the *C. femoratus* is the only representative of the *Elateridæ* which I have hitherto observed in the former, the present insect (which has precisely similar habits) would seem, singularly enough, to be the sole exponent of that immense family in the seven large islands of the latter.

XXII.—On the Habits and Reproduction of some Marine Animals.

By M. COSTE*.

By the generosity of the Emperor, and the kindness of the Minister of Public Works, I have been enabled to place the pilot Guillou in a position to organize, in the shed which covers

* Translated from the 'Comptes Rendus,' July 12, 1858, p. 45.

his lobster reservoirs on the Quay of Concarneau, an observatory, if I may be allowed to use the expression, for the investigation of the living products of the sea,—an observatory in which each species may be enclosed in a distinct cell, like the domestic animals nourished in the stalls of our stables.

A pump raises sea-water to the roof of this establishment, and accumulates it in a basin of supply, from which it falls in a continuous cascade in artificial channels, of 50 centimetres in width, arranged in gradations upon four stages, resembling, on a large scale, the hatching apparatus of the College of France. They are applied against the surrounding wall of the shed, and supported upon it by frameworks, occupying altogether a length of about 80 metres, over the lobster vivaria.

These artificial brooks, constructed of strong planks coated internally with a layer of Roman cement, are divided into ninety-five cells by partitions furnished with gratings, which afford a free passage to the current, without allowing the imprisoned species to communicate with each other. The greater part of the species thus separated in these compartments receive their nourishment like the terrestrial animals in our gardens of acclimatation, and thrive under this treatment as well as if they were in full liberty. They propagate there, and exhibit all the marvels of their instincts. We may watch their copulation, the deposition of their eggs, the development of their embryos, and all their metamorphoses, with as much facility as in the case of domestic animals; so that in a laboratory of this kind most of the animals inhabiting the sea might pass by turns under the eyes of the naturalist who is engaged in studying the laws of their organization, and reveal its mysteries to him.

Natural history, as understood by Réaumur, Huber, and Buffon, will find in this investigation, made in the midst of new conditions, inexhaustible subjects for pictures; and comparative embryogeny will extend its domain into regions from which it appeared to be interdicted.

Whilst waiting until my assistant, M. Gerbe, has executed the numerous plates belonging to our first investigations, and until I can present in his name a great work, completed under my directions, upon the metamorphoses of the Crustacea, the Academy will allow me to inform it of some of the results of our observations. I shall refer, in the first place, to the habits and the domestication of a dozen species of marine fishes, the investigation of which has enabled us to prove the accuracy of the acts related by the historians of antiquity.

Amongst the species isolated and fed in the cells of the establishment, some, such as the Old Wife (*Labrus bergylta*, Asc.), the Fifteen-spined Stickleback (*Gasterosteus Spinachia*, Linn.),

the Spotted Gunnell (*Gunnellus vulgaris*, Cuv. & Val.), the Grey Mullet (*Mugil Cephalus*, Linn.), and the Five-bearded Rock-Ling (*Gadus Mustela*, Linn.), come up to the surface of the water when we approach to give them something to eat, follow the movements which we make around them, allow themselves to be conducted towards any points to which it is desired to attract them, solicit their prey in the same way as tamed birds, and even come to seek it in the hand. The Rock-Lings are so familiar, that they may actually be captured, taken out of the water, replaced and recaptured, without attempting to make their escape.

The Gobies (*Gobius niger*, Linn., and *Gobius minutus*, Penn.) and the Sea-Scorpion (*Cottus Scorpius*, Cuv. & Val.), although not so familiar as those just mentioned, are nevertheless very attentive to all that takes place around them, and also come to take their food from the hand when it is presented to them.

The Turbot (*Rhombus maximus*, Cuv.), which from its physiognomy would be supposed destitute of expression, becomes animated nevertheless at the sight of the bait which is held out to him, and comes, agitating his broad fins, to take it from the hand; and when he is pressed by hunger, he will even float on the surface until his desires are satisfied, if he be made to wait. He swims with ease, and changes colour when he is irritated. The spots which are scattered over his body become paler and browner under the influence of the impression to which he is subjected. But the most striking point about him, is to see him, with apparently a narrow mouth, swallow, at once, fishes proportionally of enormous size. We have seen a young individual, not more than 25 centimetres in length, swallow sardines of the largest size without any difficulty.

The Pipe-fishes (*Syngnathus Typhle*, Linn.) present two curious peculiarities in their habits. They group themselves by interlacing their tails in such a way as to form tufts, and remain immoveable in a vertical position with the head upwards. When food is given to them, they move towards the prey as it is falling, follow it in its descent, and, as they approach it, perform a movement of rotation upon their axis, so as to turn the back downwards and the belly upwards. In this reversed position they precipitate themselves upon the prey, and do not resume their normal attitude until after they have seized it. This strange manœuvre is imposed upon them by the peculiar position of their mouth, which is cleft vertically at the extremity of a turned-up beak. The young animals, in which the buccal aperture has not this arrangement at the moment when they issue from the incubatory pouch, are not under the necessity of performing any such evolution. They seize their food in the same way as other fishes.

The results of these first observations are sufficient to prove the veracity of the historians of antiquity as regards the marvellous stories which they have transmitted to us of the spectacles furnished by the *nomenclators* in the marine piscinæ of Lucullus, Pollio, and the orator Hortensius. They prove that these statements, far from being fables, as people have been disposed to think, are really the simple expression of the truth.

The Crustacea enclosed in the compartments of the vivarium have also furnished us with interesting observations upon their mode of copulation, their oviposition, and their metamorphoses. In all the Brachyurous Decapods which we have been able to observe, such as the common Shore Crab (*Cancer Mænas*, Linn.), the *Xantho floridus* of Leach, the Arched-fronted Swimming-Crab (*Portunus Rondeleti*, Risso), the Marbled Swimming-Crab (*Portunus marmoreus*, Leach), the hairy Porcelain Crab (*Porcellana platycheles*, Penn.), the Spider-Crab (*Maia Squinado*, Herbst), the common edible Crab (*Cancer Pagurus*, Linn.), the minute Porcelain Crab (*Porcellana longicornis*, Lat.), &c., we have seen the male, by the agency of his copulatory styles, and through the sternal apertures, deposit the semen in a dilatation of the oviduct, a dilatation situated at the lower extremity of that canal.

In the Shore Crab (*C. Mænas*) the semen accumulated in this place of deposit becomes solidified and moulded there, acquiring the consistence of coagulated wax. It remains in this state for about a fortnight, after which it slowly becomes liquefied, in order that the spermatozoids, which are then disaggregated and suspended in the fluid resulting from this liquefaction, may ascend to the ovaries,—a phenomenon which lasts not less than two months. The ovarian eggs, which at the moment of copulation were still in the microscopic state, increase in proportion, but do not arrive at complete maturity until long after the complete disappearance of the seminal fluid. We are observing, in closed cases, specimens which copulated three months since, and which have not yet deposited their eggs. The dissection of some of these has shown us that the eggs are far from having attained the degree of development required for their expulsion. This fact proves two things:—1. That in these species the fecundation is ovarian; and 2. that when submitted to the influence of the male element, the ova are far more distant from the period of their maturity than is the case in any of those observed in other classes.

In the Long-tailed Decapods (*Macrura*) the semen is not introduced into an internal pouch, but it is poured out upon the sternum in the vicinity of the orifices which lead to the oviducts. In some, such as the Lobsters and Spiny Lobsters, it is spread

out in irregular plates upon a surface of considerable extent; in others, such as the Prawns and Shrimps, the semen is emitted in the form of spermatophora, which are attached to the plastron or to the base of the feet of the females. In these species, therefore, the spermatozooids must become disaggregated externally to reach the oviducts, without their being introduced there by the males. But the fecundation is not less ovarian than in the preceding, although it approaches more nearly to the period of oviposition. There are even species in which it only precedes the expulsion of the eggs by a few hours. Thus, for example, we have seen a Prawn (*Palæmon serratus*, Leach) copulate on one day and deposit its eggs on the next.

As all the Crustacea carry their eggs under the tail, or upon some other part of the body where the incubation takes place, and as this incubation is generally very slow (it does not last less than five or six months in the Lobsters and *Palinuri*), it follows that the animals of this class, in casting their shells, would have been liable to lose their progeny, unless, by an admirable combination, the periods of the oviposition had not been calculated in relation to those of the moults to which these species are annually subjected until they have acquired their definitive size. Thus, to obtain all the time necessary for incubation, nature has chosen that fecundation should take place immediately after the mothers have thrown off their old skins, in order that the new ones may be a sufficiently lasting protection.

We have seen a striking proof of this fact in the common Shore Crab and the Prawn of our coasts. The male of the former species selects a female, holds her tightly with the right foot of the second pair, carries her with him, whether he walks or swims, and seizes her again if they be separated. Some days after this union, the female, still held by the male, throws off her old covering; and immediately after this moult is effected, she turns to receive the semen,—an operation which lasts one, two, or three days.

In the Prawn (*Palæmon serratus*, Leach), the male does not take possession of the female before the moult, as in the common Shore Crab; but as soon as she has moulted, he pursues her, darts upon her back, clings there, and allows himself to be carried about without making any attempt at copulation as long as the female swims; when she stops, he glides under her by inverting the right side, deposits a double spermatophore upon her plastron in a few seconds, and then resumes his former position, to recommence the same manœuvre a moment afterwards.

There are some species which have two broods between each moult, and in which the copulation fecundating the first generation appears also to fecundate the second; of this w

believe we have a proof in twelve females of *Maia Squinado*, isolated in a basin, all of which have produced eggs a second time without another copulation, at the very moment when the last eggs of the preceding gestation had been hatched.

Such, amongst the numerous facts which we have observed, are those which I have thought it advisable to communicate at present to the Academy. At a subsequent meeting we shall present the general results of our observations upon the first metamorphoses of the Crustacea. From these observations it results that all the known *Zoëas* described by various authors are the larvæ of Brachyurous Decapods, and that it is not demonstrated that the typical *Zoëa* of Bosc is, as usually supposed, an embryo of the Edible Crab of our coasts, and still less of the Lobster.

In order that the investigations which have furnished us with these facts may not be interrupted during our absence, the pilot Guillou keeps a register, in which, in conformity with instructions drawn up beforehand, and which he follows with sagacity, he inscribes, at the number corresponding to each cell, whatever bears upon the experiments carried on therein. As soon as an interesting fact is exhibited, he informs us of it; and if the fact be of a nature capable of verification in Paris, he sends us the animals presenting it; in the contrary case, one of us goes to Concarneau to study the phænomenon on the spot.

XXIII.—*Characters of some apparently undescribed Ceylon Insects.* By F. WALKER.

Order COLEOPTERA.

Fam. Cicindelidæ.

CICINDELA DISCREPANS. Atra, elytris guttis duabus humeralibus vittisque duabus postice macularibus flavis, femoribus cupreis. Long. $6\frac{1}{2}$ —8 lin.

TRICONDYLA FEMORATA. Nigra, transverse rugulosa, prothorace sublineari antice coarctato, femoribus piceis, tibiis tarsisque cyaneis. Long. 10 lin.

Fam. Carabidæ.

CYMINDIS RUFIVENTRIS. Ater, nitidus, antennis piceis, thorace sulcato, abdomine subtus rufo, elytrorum sulcis parallelis punctatis bene determinatis, pedibus piceis, femoribus crassis. Long. 4 lin.

DROMIUS MARGINIFER. Niger, nitidus, subtus piceus, palpis antennisque fulvescentibus, thoracis lateribus rufescentibus, elytrorum maculis duabus magnis humeralibus duabusque minoribus posticis discalibus rufescentibus. Long. $2\frac{1}{2}$ lin.

LEBIA BIPARS. Rufa, thorace subsulcato sat angusto, elytris atris sat latis tenuiter sulcatis. Long. 3 lin.

CATASCOPUS REDUCTUS. Viridi-niger, capite magno sulcis duobus lateralibus, thoracis sulco dorsali distincto, sulco brevi transverso antico arcuato, elytrorum sulcis punctatis bene determinatis. Long. $4\frac{1}{2}$ lin.

SCARITES OBLITERANS. Niger, nitens, thorace subcordato, sulco tenui antice abbreviato, elytris subconvexis marginatis, sulcis paucis vix conspicuis, tibiis anticis fortiter bidentatis. Long. $6\frac{1}{2}$ lin.

SCARITES SUBSIGNANS. Niger, nitidus, capite bisulcato, thorace subquadrato subsulcato, elytris subconvexis marginatis, sulcis sex distinctis, tibiis anticis fortiter bidentatis. Long. $6\frac{1}{2}$ lin.

SCARITES DESIGNANS. Niger, nitidus, capite bisulcato foveis duabus transversis, thorace quadrato sulcato, elytris convexis, sulcis quinque distinctissimis, pedibus anticis incrassatis, tibiis fortiter tridentatis. Long. 7–8 lin.

CLIVINA RECTA. Nigro-picea, linearis, antennis pedibusque piceis, thorace sulcato, elytrorum sulcis distinctis. Long. $3\frac{1}{2}$ lin.

MORIO TROGOSITOIDES. Niger, depressus, vix nitidus, capite bisulcato, thorace subcordato sulcato postice bifoveolato, elytrorum sulcis distinctissimis, tibiis anticis fortiter bidentatis. Long. $6\frac{1}{2}$ lin.

MORIO CUCUJOIDES. Niger, depressus, nitidus, corpore subtus pedibusque rufis, capite bisulcato, thorace subcordato sulcato postice bifoveolato, elytrorum sulcis distinctissimis, tibiis anticis fortiter bidentatis. Long. $5\frac{1}{2}$ lin.

LEISTUS? LINEARIS. Niger, nitidus, capite antico, corporis disco subtus, antennis pedibusque testaceis, thorace subcordato bifoveolato, elytris sulcatis. Long. 3 lin.

CARDIADERUS SCITUS. Niger, nitidus, antennis ferrugineis, thorace sulcato transverse foveolato, elytris subnitidis, sulcis scitis approximatis, pedibus testaceis. Long. $2\frac{1}{2}$ lin.

ANCHOMENUS ILLOCATUS. Niger, nitidus, thorace sulcato, elytrorum sulcis distinctis, pedibus rufescentibus. Long. $2\frac{1}{2}$ lin.

AGONUM PLACIDULUM. Nigrum, nitidum, thorace foveis duabus posticis, elytrorum sulcis distinctis, pedibus piceis. Long. $2\frac{1}{2}$ lin.

PANAGÆUS RETRACTUS. Niger, subtus fulvus, thorace subcordato sulcato postice contracto, elytris luteo quadriplagiatis, pedibus testaceis. Long. 3 lin.

Genus MARAGA. = *Orthocentrus*.

Caput transversum, sublæve, planum. Oculi magni. Palpi breves, subsecuriformes. Antennæ capite thoraceque paullo longiores, articulis longiusculis. Thorax transversus, postice latus angulatus, antice rotundatus, lateribus subconvexis. Elytra marginata, apice

truncata, thorace latiora, sulcis optime determinatis. Pedes validi, breviusculi, femoribus crassis, posticis bidentatis, tibiis subsetosis.

MARAGA PLANIGERA. Niger, capite antico corporeque subtus fulvis, antennis, pedibus necnon thoracis et elytrorum marginibus piceis, coxis et femoribus testaceis, femoribus posterioribus nigro vittatis. Long. 4 lin.

ARGUTOR DEGENER. Niger, nitidus, thorace subcordato sulcato, elytris tenuiter sulcatis, pedibus ferrugineis. Long. $2\frac{1}{2}$ lin.

ARGUTOR RELINQUENS. Niger, nitidus, thorace subrotundato, elytris sulcatis, pedibus ferrugineis. Long. 2 lin.

HARPALUS STOLIDUS. Niger, nitidus, thorace subpunctato, elytris sulcatis nigro-viridibus, pedibus ferrugineis. Long. $2\frac{1}{2}$ –3 lin.

CURTONOTUS COMPOSITUS. Niger, nitidus, antennis piceis, thorace subsulcato, elytris sulcatis subobscuris, pedibus rufescentibus. Long. $3\frac{1}{2}$ lin.

SELENOPHORUS INFIXUS. Niger, nitidus, thorace utrinque apud marginem posticum impresso, elytris nigro-æneis sulcatis, pedibus piceis. Long. 2 lin.

ACUPALPUS DEROGATUS. Niger, nitidus, elytris sulcatis, pedibus rufescentibus. Long. $1\frac{1}{2}$ lin.

ACUPALPUS EXTREMUS. Niger, nitidus, thorace subrotundato, elytris non sulcatis, pedibus piceis. Long. $\frac{3}{4}$ lin.

BEMBIDIUM FINITIMUM. Niger, nitidus, thorace subrotundato, elytris postice fulvo bimaculatis. Long. 1 lin.

Fam. Dytiscidæ.

DYTISCUS EXTENUANS, mas. Ater, nitidus, capitis margine antico et thoracis lateribus luteis, elytris vitta submarginali postice attenuata et apices non attingente. Long. 8 lin.

HYDATICUS DISCINDENS, mas. Ater, nitidus, capite antico thoracisque lateribus latissime luteo marginatis, elytris linea submarginali apud medium dislocata, fascia antica utrinque flexuosa, lineolis exterioribus postmediis guttaque utrinque postica luteis. Long. 6 lin.

HYDATICUS FRACTIFER, mas. Ater, nitidus, capite antico thoracisque lateribus latissime luteo marginatis, elytrorum fascia guttulari antica lineolisque marginalibus luteis. Long. $5\frac{1}{2}$ lin.

COLYMBETES INTERCLUSUS. Ater, capite antico, thoracis lateribus latis, elytrorum fascia lata basali et vitta marginali postice attenuata luteo-ferrugineis. Long. $5\frac{1}{2}$ lin.

HYDOPORUS INTERPULSUS. Niger, crassus, capite, thoracis fascia latissima et elytrorum margine tenui luteo-ferrugineis. Long. $1\frac{3}{4}$ lin.

HYDOPORUS INTERMIXTUS. Niger, latus, thoracis lateribus, elytrorum fascia lata basali et margine tenui postice dilatata luteo-ferrugineis. Long. $1\frac{5}{4}$ lin.

HYDROPORUS LÆTABILIS. Luteus, elytris nigris, fasciis duabus abbreviatis luteis, 1^a lata interrupta, 2^a integra. Long. 1 lin.

Fam. Gyrinidæ.

DINEUTES INDICANS. Chalybeus, subtus ferrugineus, capitis lateribus subcupreis, elytris extus impressis, apice truncatis et angulatis, tibiis anticis spinosis. Long. 7 lin.

GYRINUS OBLIQUUS. Æneo-chalybeus, elytrorum carinis sulcisque alternis bene determinatis, pedibus ferrugineis. Long. 3 lin.

Fam. Staphylinidæ.

OCYPUS LONGIPENNIS. Niger, punctatissimus, subtus piceus, antennis pedibusque piceis, thorace carinato, elytris longiusculis. Long. 4 lin.

OCYPUS CONGRUUS. Cyaneo-niger, subpunctatus, subtus piceus, antennis, pedibus elytrisque piceis, thorace e punctis bilineato, abdomine nigro, segmentorum marginibus posticis piceis. Long. 5 lin.

OCYPUS PUNCTILINEA. Nigro-æneus, capite et thorace glabris nitentibus, capite punctis lateralibus, antennis pedibusque piceis, thorace e punctis bilineato, elytris punctatissimis, abdomine nigro. Long. 4½ lin.

XANTHOLINUS CINCTUS. Niger, capite thoraceque nitentibus, antennis piceis, pedibus piceo-ferrugineis, elytris lividis basi nigris. Long. 2½ lin.

PÆDERUS ALTERNANS. Ater, thorace et abdominis bis triente basali rufis, elytris nigro-cyaneis. Long. 3 lin.

PROGNATHA DECISA. Atra, plana, capite thoraceque nitentibus, capite lato, thorace obcordato, elytris testaceis, apud marginem anteriorem apice excepto nigris. Long. 2 lin.

OXYTELUS RUDIS. Niger, sat latus, antennis pedibusque ferrugineis, thorace elytrisque punctatissimis, thorace unisulcato subcordato. Long. 2½ lin.

OXYTELUS PRODUCTUS. Niger, longiusculus, sat angustus, ore pedibusque ferrugineis, thorace elytrisque punctatissimis, thorace unisulcato subcordato. Long. 2 lin.

OMALIUM FILIFORME. Nigrum, nitens, longum, planum, perangustum, antennis validis, pedibus fulvis. Long. 1¾ lin.

ALEOCHARA POSTICA. Nigra, nitida, *A. fuscipedi* simillima, pedibus ferrugineis, abdominis apice piceo-ferruginea. Long. 2¼–3 lin.

Fam. Scydmanidæ.

Genus ERINEUS.

Corpus convexum, rude punctatum, dense pubescens. Caput postice maximum, subdilatum. Palpi clavati. Antennæ subclavatæ,

geniculatæ, pilosæ; articulus 1^{us} longus, 2^{us} et sequentes oblongi, subæquales. Thorax subquadratus. Elytra oblonga. Pedes validi, pilosi.

ERINEUS MONSTROSUS. Piceus, subtus nigricans, capite antico femoribusque nigricantibus. Long. 3 lin.

Fam. Phalacridæ.

PHALACRUS CONJICIENS. Piceus, nitens, subellipticus, thorace lævi, elytris striatis. Long. $\frac{4}{5}$ lin.

PHALACRUS CONFECTUS. Testaceus, suborbicularis, nitens, thorace lævi, elytris subtilissime striatis. Long. $\frac{1}{2}$ lin.

Fam. Nitidulidæ.

NITIDULA CONTEGENS. Nigra, elytris basi (margine excepto) et apud suturam (triente apicali excepta) testaceis. Long. $1\frac{1}{2}$ lin.

NITIDULA INTENDENS. Parva, testacea, elytris subtomentosis truncatis. Long. $\frac{2}{3}$ lin.

NITIDULA SIGNIFICANS. Parva, testacea, nitens, elytris nigro quadrimaculatis. Var. elytrorum maculis subobsoletis. Long. $\frac{3}{4}$ lin.

NITIDULA? TOMENTIFERA. Fusca, capite thoraceque cinereo-pubescentibus, elytrorum fasciis interruptis cano-tomentosis. Long. $1\frac{2}{3}$ lin.

Genus NITIDULOPSIS.

Nitidulæ valde affinis, *Anthobio* simillima. Abdomen elytris duplo longius.

NITIDULOPSIS ÆQUALIS. Picea, depressa, subtus ferrugineo-picea, elytris testaceis, pedibus pallide testaceis. Long. $1\frac{1}{4}$ lin.

RHYZOPHAGUS PARALLELUS. Niger, linearis, capite sulcis duabus lateralibus, thorace nitente postice retracto et bisulcato, elytris striatis et carinatis, carinis apud latera magis determinatis. Long. $2-2\frac{1}{2}$ lin.

Fam. Colydiadæ.

LYCTUS DISPUTANS. Ferrugineo-piceus, thorace sulcato oblongo subquadrato, elytris scite subsulcatis. Long. $2\frac{1}{2}$ lin.

LYCTUS RETRACTUS. Ferrugineus, subtus rufescens, thoracis lateribus flexis angulatis, elytris subtilissime punctatis et sulcatis. Long. $2-2\frac{1}{2}$ lin.

DITOMA RUGICOLLIS. Picea, thorace sulcis quatuor rugosis, elytris quinque-carinatis, carinis serratis bene determinatis. Long. 1 lin.

Fam. Trogositidæ.

TROGOSITA INSINUANS. Picea, subtus rufescens, capite thoraceque subsulcatis scite punctatis, elytris punctato-sulcatis. Long. 3 lin.

Fam. Cucujidæ.

SILVANUS RETRAHENS. Ferrugineus, capite piceo, elytris subtilissime sulcatis. Long. $1\frac{1}{2}$ lin.

Fam. Lathridiadæ.

LATHRIDIUS PERPUSILLUS. Piceus, minimus, thorace subrotundato, elytris rude tricarinatis. Long. $\frac{1}{3}$ lin.

MONOTOMA CONCINNULA. Testacea, elytris apud medium nigro-bimaculatis. Long. 1 lin.

Fam. Dermestidæ.

ATTAGENUS? DEFECTUS. Niger, pubescens, elytris subtilissime punctatis apice ferrugineis. Long. 1 lin.

TRINODES HIRTELLUS. Ater, minutus, elytris apices versus subhispidis. Long. $\frac{1}{2}$ lin.

Fam. Histeridæ.

PLATYSOMA DESINENS. Atrum, elytrorum sulcis tribus exterioribus completis, 4^a 5^a-que valde abbreviatis, 5^a paullo longiore. Long. $1\frac{3}{4}$ lin.

PLATYSOMA RESTORATUM. Rufescenti-piceum, elytrorum sulcis quinque bene determinatis, tribus exterioribus completis, 4^a 5^a-que abbreviatis æqualibus. Long. $1\frac{3}{4}$ lin.

Fam. Aphodiadæ.

APHODIUS ROBUSTUS. Piceo-ferrugineus, capite utrinque impresso, thorace vage punctato, elytris conferte punctato-sulcatis, femoribus crassis. Long. $2\frac{1}{2}$ lin.

APHODIUS DYNASTOIDES. Ater, antennis piceis, capite subglabro, thorace conferte punctato, elytrorum sulcis subpunctatis bene determinatis. Long. $2\frac{1}{4}$ lin.

APHODIUS PALLIDICORNIS. Niger, capitis margine antico piceo, antennis testaceis, thorace vage subpunctato, elytrorum sulcis punctatis bene determinatis, pedibus ferrugineis. Long. 2 lin.

APHODIUS MUTANS. Niger, subtus luridus, thorace vage punctato, lateribus late margineque postico tenuiter luridis, elytrorum margine lato lurido, vittis discalibus luridis plus minusve distinctis aut obsoletis, pedibus testaceis. Long. $2\frac{1}{4}$ - $2\frac{1}{2}$ lin.

APHODIUS SEQUENS. Niger, capite maculis duabus luridis, thoracis margine late lurido, elytris luridis, disco fuscescente, pedibus testaceis. Var. capite lurido. Long. $1\frac{1}{2}$ - $1\frac{1}{2}$ lin.

PSAMMODIUS INSCITUS. Niger, capite rugoso apud marginem piceo, antennis ferrugineis, thorace rugis quinque transversis non parallelis, elytrorum sulcis plurimis bene determinatis, carinis subtuberculatis. Long. $1\frac{1}{4}$ lin.

Fam. Trogidæ.

TROX INCLUSUS. Niger, capite subtuberculato, antennis testaceis, thorace trisulcato, lateribus impressis, marginibus subangulatis, elytris tuberculoso-tricarinatis, pustulis intermediis minoribus. Long. 4-5 lin.

Fam. Copridæ.

GYMNOPLEURUS SMARAGDIFER. Smaragdino-viridis, subtus obscurior, capite exciso, thorace quadri-impresso, sulco antice obsoleto, elytrorum lineis vix conspicuis. Long. 7 lin.

SISYPHUS SETOSULUS. Niger, capite dentato, thorace elytrisque setosis, thorace scaberrimo, elytrorum carinis plurimis tuberculosus indeterminatis, tibiis anticis fortiter tridentatis. Long. 3 lin.

SISYPHUS SUBSIDENS. Niger, capite dentato, thorace elytrisque subsetosis, thorace sublævi, elytrorum carinis paucis indecis, tibiis anticis subtridentatis. Long. 2 lin.

COPRIS CRIBRICOLLIS. Ater, capite thoraceque confertissime verrucosis, thorace sulco tenui dorsali antice obsoleto, elytris glabris, lineis octo impressis bene determinatis. *Mas.* Capitis cornu recto thoracem paullo superante, thorace carinis duabus dorsalibus abbreviatis, spatio posteriore glabro. *Fæm.* Capitis carina transversa subconica. Long. 7 lin.

COPRIS REPERTUS. Ater, capite verrucoso, thorace sublævi, sulco dorsali antice obsoleto, elytris glabris, lineis octo impressis bene determinatis. *Mas.* Capitis cornu subarcuato thoracem non superante, thorace ruga transversa quadridentata. *Fæm.* Capitis carina transversa brevi elevata bidentata, thoracis carina transversa non dentata. Long. 8 lin.

COPRIS SODALIS, mas. Ater, capite thoraceque conferte punctatis, capite inter oculos tuberculo transverso, thorace carina transversa subobsoleta, sulco dorsali antice obsoleto, elytris glabris, lineis octo impressis bene determinatis. Long. $5\frac{1}{2}$ lin.

COPRIS SIGNATUS, fæm. Ater, capite, thorace elytrisque confertissime punctatis, capite inter oculos tuberculo transverso, thorace carina nulla transversa, sulco dorsali vix conspicuo, elytrorum lineis octo impressis bene determinatis. Long. $4\frac{1}{2}$ -5 lin.

COPRIS DIMINUTIVUS, mas. Ater, pubescens, conferte punctatus, capite cornubus duobus posticis brevissimis, thorace plano, elytrorum lineis impressis indistinctis. Long. $1\frac{1}{2}$ lin.

ONTHOPHAGUS PROLIXUS. Cupreus aut æneo-viridis, punctatus, thorace antice utrinque excavato, sulco dorsali, elytris luridis lineatis, fascia media lata angulata maculaque antica nigris. Long. $2\frac{1}{2}$ -3 lin.

ONTHOPHAGUS GRAVIS, fæm. Niger, parum nitens, capite thoraceque planis punctatissimis, elytrorum lineis impressis planis non bene determinatis. Long. $3\frac{1}{2}$ lin.

ONTHOPHAGUS DIFFICILIS. Ater aut nigro-viridis, capite antice rude punctato, thorace nitidissimo vage punctato, lateribus maculisque duabus posticis nonnunquam obsoletis testaceis, elytris testaceis, lineis impressis punctatis bene determinatis, fasciis sex abbreviatis nonnunquam connexis nigris. Long. $2\frac{1}{2}$ –3 lin.

ONTHOPHAGUS LUCENS. Viridis, capite antice rude punctato, thorace elytrisque confertissime punctatis, elytris testaceis, lineis impressis sat determinatis, fascia media maculari maculisque duabus anticis duabusque posticis nigris. Long. $1\frac{1}{2}$ lin.

ONTHOPHAGUS NEGLIGENS. Viridi- aut cupreo-niger, capite antico rude punctato, thorace punctatissimo, elytris punctatis, lineis impressis non distinctis, maculis duabus apicalibus testaceis. Var. Elytris testaceo plus minusve marginatis, pedibus testaceo variis. Long. $1\frac{1}{2}$ – $2\frac{1}{2}$ lin.

ONTHOPHAGUS MÆRENS, mas. Ater, subpunctatus, capite carina media transversa arcuata, cornubus duobus posticis erectis vix arcuatis, thorace antice utrinque impresso, elytrorum lineis impressis punctatis bene determinatis. Long. 3 lin.

ONTHOPHAGUS TURBATUS. Nigro-viridis, punctatissimus, capite carina media transversa arcuata, thorace sulco dorsali subobsoleto, elytrorum lineis impressis sat determinatis. *Mas.* Capite cornu lanceolato postice subobliquo, thorace antice excavato. *Fœm.* Capite carina transversa postica, thorace carina transversa antica brevissima. Long. 3 lin.

Fam. Sphæridiadae.

SPHÆRIDIDIUM TRICOLOR. Nigrum, nitens, thorace elytrisque testaceo marginatis, elytris antice rufo bimaculatis, spatio apicali testaceo maculas duas nigras subincludente. Long. $1\frac{3}{4}$ lin.

Fam. Hydrophilidae.

PHILHYDRUS ESURIENS. Lividus, subtus niger, capite nigro, thoracis macula transversa discali fuscescente. Long. $\frac{3}{4}$ lin.

HYDROBIUS STULTUS. Niger, subtilissime et confertissime punctatus, subtus vix nitens, pedibus piceo-nigris. Long. $1\frac{3}{4}$ lin.

Genus DASTARCUS.

Corpus longiusculum. Prothorax sulcatus, punctatus, angulis anticis porrectis acutis, pectoris foveis duabus obliquis. Metascutellum subtus maximum, vix sulcatum. Elytra sulcata, punctata. Pedes crassi, breves.

DASTARCUS POROSUS. Niger, subtus nitens, rude punctatus, prothorace elytrisque rude punctatis carinis ferrugineo-tomentosis, prothoracis carinis duabus undulatis. Long. 4 lin.

[To be continued.]

BIBLIOGRAPHICAL NOTICES.

Narrative of the Expedition of an American Squadron to the China Seas and Japan, performed in the years 1852, 1853 and 1854, under the command of Commodore M. C. Perry, United States Navy. By order of the Government of the United States. Vols. I. and II., with Illustrations. Washington, 1856. London, Trübner & Co.

THE second volume of Commodore Perry's Narrative of the celebrated "Japanese Expedition" contains, amongst a number of communications in relation to other topics from different members of the Expedition, several articles on natural history, which those who are interested in the zoology, botany, or geology of the Western Pacific should not neglect to consult. The smallest contributions towards a knowledge of the natural productions of ground so seldom trodden by Europeans as Japan, Formosa, or the Loo Choo Islands, is acceptable. It would be well if our own Government would take the hint, and insist upon the members of our numerous expeditions making their discoveries immediately available to the student.

The first part of the second volume of the present book is occupied by several articles upon the botany, agriculture, and geology of the Loo Choo archipelago. This is followed by Reports upon the agriculture of Japan and China and the coal-formation of Formosa, and an interesting account of the small settlement upon Peel Island, one of the Bonin group, with a copy of the short "Articles of Agreement" which constitute the laws of this primitive republic. Next come the papers on natural history, with which we are more immediately concerned. Two articles by Mr. Cassin upon the birds collected (principally by Mr. William Heine, the artist of the Expedition) are worthy of much attention, though they contain few novelties in the way of undescribed species. The first of these relates to the birds collected in Japan, most of which have been already noticed in Temminck and Schlegel's volume of the magnificent 'Fauna Japonica' devoted to the "Aves." But as Nangasaki in the southern island of Kiusiu is the only place to which the Dutch naturalists have had access, and the present collections were formed in Nippon and Jesso (the two northern and principal islands), the collection is still one of high interest. We may call particular attention to the details given of Mr. Heine's pheasant-shooting expeditions. He is certainly the first "of any cultivated nation" who has had the good fortune to beat up the native haunts of *Phasianus versicolor* and *Phasianus Soemmeringii*. We are not at all surprised at his missing the latter bird, or "at least only shooting off his two long tail-feathers;" for even an ordinary cock pheasant (*Phasianus colchicus* ♂) rising near (with a tail only one-third as long) is sufficient to agitate one not a little. But let us give Mr. Heine due credit for having preserved examples of these fine birds, and thus fixed their real locality. Our countryman Mr. Atkinson, in the steppes of Tartary—a region still more inaccessible—seems to have shot and eaten

many brace of the still rarer *Phasianus mongolicus* without the slightest compunction.

Mr. Cassin's second article upon the "birds collected in China, the Loo Choo Islands, Singapore, Ceylon, and California," is acceptable, as giving exact localities to many species of the correct *habitat* of which we were not hitherto very certain. There are also nice figures of *Garrulax perspicillatus*, *Heterornis sericea*, and the true *Ixos hæmorrhous* of China. Only four birds are noticed from the Loo Choo Islands, which, curiously enough, are, with one exception, identified with European species: *Ardea cinerea*, *Alcedo bengalensis*, *Fulica chloropus*, and *Sterna minuta*. Mr. Brevoort's notice of Japanese fish, or rather, of the drawings of them made by members of the Expedition (for it appears that no specimens were brought home), accompanies a series of plates made from these drawings. We decidedly object to the practice of describing new species of fishes (or, in fact, of any animals) from drawings, particularly when made, as these are confessed to have been, without a "close attention to the specific characters." But the discovery that *Ditrema Temmincki* probably belongs to the singular viviparous family *Embiotocidae*, recently discovered in California, is certainly of great interest.

Mr. Jay has contributed a report upon the "Shells" collected by the Expedition, and Professor Asa Gray and others an essay on the dried plants.

There is also a very interesting account of the "Gulf-stream" and cyclones of the Western Pacific; and the volume closes with a facsimile of the Japanese version of the celebrated treaty of Kan-a-ga-wa, the "first formal instrument of the kind ever negotiated by the empire of Japan with any Christian nation."

The Angler in the Lake District; or Piscatory Colloquies and Fishing Excursions in Westmoreland and Cumberland. By JOHN DAVY, M.D., F.R.S. &c. Longmans.

Sir Humphry Davy was the author of two delightfully desultory works, one, the 'Salmonia,' and the other, 'Consolations in Travel, or the Last Days of a Philosopher.' Dr. Davy, the brother of the great chemist, is also an accomplished man, who has been engaged in the army medical service from his early manhood. Dr. Davy resided long in Ceylon and the West Indies, traversed many parts of the world, and in mature age has retired to the Lake country. He lives not far from another distinguished medical officer, well known to our readers as the friend and companion of Sir John Franklin, who did what he could, brave man! to find that arctic hero on the dreary North American coast. He is the author of the 'Fauna Boreali-Americana,' and many a goodly memoir and work on Exotic Fishes; while his new edition of Yarrell's 'British Fishes,' expected this year, will have a scientific exactness which the worthy Waltonian disciple, who wrote 'British Birds' and 'British Fishes,' never affected to possess, to say nothing of its many additions. Dr. John Davy and Sir John Richardson are resting (*not* on their oars) amid the calm

scenery of the Lakes of Cumberland and Westmoreland, and still think and work and publish. Here is a book by Dr. Davy, full to the brim of natural-history notes, in the wide—the Linnæan—sense of the term. The ichthyologist may derive much valuable information on the breeding and embryology of fish of the family Salmonidæ; see pages 165–183, where the author shows himself to be a keen observer and an accurate as well as pleasing writer. Turn to page 209, where he shows how the *smolt* loses in great measure the transverse markings of the *parr*,—the very silvery scales of the *smolt* having much lustrous matter deposited on their inner surface, and thus hiding the markings in the true skin.

But, besides Fish, Dr. Davy enlightens his readers on many other points of natural history.

Sir Emerson Tennant might derive an excellent anecdote for the inimitable monograph, *Biography of the Elephant*, still unpublished, but eagerly expected in his great work on Ceylon, were he to turn to p. 23, where Dr. Davy gives a striking proof that the Elephant *can* submit, without flinching, to a painful operation as well as many a man.

Dr. Davy introduces anecdotes of dogs;—of poultry in the West Indies, see p. 26;—the swan's nest, and how and by whom constructed, at p. 281. Ulpha Kirk and the beautiful lines of Wordsworth lead him to the wilds of Ceylon, and the pleasure he experienced, after a long journey, on coming in sight of a cocoa-nut palm,—as he remarks that it is never met with in the wild woods, but, by its presence, always marks out human dwellings (p. 245).

Meteorology and geology are treated most interestingly, in certain aspects that come before “Piscator” and “Amicus” as they wander amidst the scenery where William Wordsworth lived, observed, and wrote. What naturalist loves not to read and quote Wordsworth, particularly if wild flowers and gentle birds be his subjects? This pleasant book contains much to interest him, and indeed every reader of that great poet who sung the praises of the March Celandine, and in *one line* fixed, for ever, the Swan, that “queen of our lakes” and calmly flowing rivers. At this autumn season, the hills have a quiet soothing melancholy pleasure in their contemplation; and should any of our readers visit the hills and lakes of Westmoreland, they would thank us for recommending them to take, in addition to their guide-book, be it Adam Black's or Miss Martineau's, this prettily got-up green cloth pocket volume, full of facts and records of the wanderings and observations of an accomplished physician. The book is pervaded by a quiet religious and poetic tone, and is also full of kindly views of man and every lower creature.

The Practical Naturalist's Guide, containing Instructions for Collecting, Preparing, and Preserving Specimens of all Departments of Zoology. By JAMES BOYD DAVIES, Assistant Conservator in the Natural History Museum, Edinburgh. Maclachlan and Stewart, Edinburgh. 1858, 12mo.

In this little book of about 80 pages Mr. Davies has furnished the student of Zoology with an excellent manual of directions for

collecting and preserving specimens of the various sections of the Animal Kingdom. The instructions given are most sensible, and we think Mr. Davies has exercised a sound judgment in excluding all descriptions of the mode of stuffing the Mammalia and Birds, as this, which usually occupies a considerable space in similar manuals, can scarcely be taught by any written instructions. We think, however, that he should have found some means of indicating this upon his title-page,—the setting-up of such specimens is undoubtedly one branch of “preparing” animals; and the country naturalist who might buy this book in the hope of getting information upon the subject, would feel justly aggrieved at finding no instructions in stuffing in its pages.

In recommending the ‘Practical Naturalist’s Guide’ to our readers, we must not omit to notice one section of it, which, although occupying only three or four pages, will render it a handy book even to the experienced naturalist. We allude to the “Recipes” for arsenical soaps, preservative fluids, &c.,—details which are very liable to slip out of the memory, whilst manuscript memoranda are frequently mislaid.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL INSTITUTION OF GREAT BRITAIN.

May 21, 1858.—The Duke of Northumberland, K.G., F.R.S.,
President, in the Chair.

“On the Phænomena of Gemmation.” By Thomas H. Huxley, F.R.S., Fullerian Professor of Physiology, Royal Institution, and Professor of Natural History, Government School of Mines, Jermyn Street.

The speaker commenced by stating that a learned French naturalist, M. Duvau, proposed, many years ago, to term the middle of the eighteenth century “l’époque des Pucerons,” and that the importance of the phænomena which were at first brought to light by the study of these remarkable insects renders the phrase “epoch of Plant-lice,” as applied to this period, far less whimsically inappropriate than it might at first sight seem to be.

After a brief sketch of the mode of life of these Plant-lice, or *Aphides*, as they are technically termed,—of the structure of their singular piercing and sucking mouths, and of their relation to what are called “blights,” the circumstances which have more particularly drawn the attention of naturalists to these insects were fully detailed.

It was between the years 1740 and 1750, in fact, that Bonnet, acting upon the suggestions of the illustrious Réaumur, isolated an *Aphis* immediately after its birth, and proved to demonstration, that not only was it capable of spontaneously bringing forth numerous

living young, but that these and their descendants, to the ninth generation, preserved a similar faculty.

Observations so remarkable were not likely to pass unheeded ; but notwithstanding the careful sifting which they have received, Bonnet's results have never been questioned. On the contrary, not only have Lyonnet, Degeer, Kyber, Duvau, and others, borne ample testimony to their accuracy, but it has been shown that, under favourable conditions of temperature and food, there is practically no limit to this power of asexual multiplication, or, as it has been conveniently termed, "agamogenesis."

Thus Kyber bred the viviparous *Aphis Dianthi* and *Aphis Rosæ* for three years in uninterrupted succession ; and the males and true oviparous females of the *A. Dianthi* have never yet been met with. The current notion that there is a fixed number of broods, "nine or eleven," is based on a mistake.

As, under moderately favourable conditions, an *Aphis* comes to maturity in about a fortnight, and as each *Aphis* is known to be capable of producing a hundred young, the number of the progeny which may eventually result even from a single *Aphis* during the six or seven warm months of the year is easily calculated. M. Tougaard's estimate, adopted (and acknowledged) by Morren, and copied from him by others, gives the number of the tenth brood as one quintillion. Supposing the weight of each *Aphis* to be no more than $\frac{1}{1000}$ th of a grain, the mass of living matter in this brood would exceed that in the most thickly populated countries in the world.

The agamogenetic broods are either winged or wingless. The winged forms at times rise into the air, and are carried away by the wind in clouds ; and these migrating hordes have been supposed to be males and females, swarming like the ants and bees ! During the summer months it is unusual to meet other than viviparous *Aphides*, whether winged or wingless ; but ordinarily, on the approach of cold weather, or even during warm weather, if the supplies of food fall short, the viviparous *Aphides* produce forms which are no longer viviparous, but are males and oviparous females. The former are sometimes winged, sometimes wingless. The latter, with a single doubtful exception, are always wingless.

The oviparous females lay their eggs, and then, like the males, die. It commonly happens also that the viviparous *Aphides* die, and then the eggs are left as the sole representatives of the species ; but, in mild winters, many of the viviparous *Aphides* merely fall into a state of stupor, and hibernate, to re-awake with the returning warmth of spring. At the same time, the eggs are hatched, and give rise to viviparous *Aphides*, which run through the same course as before. The species *Aphis*, therefore, is fully manifested, not in any one being or animated form, but by a cycle of such, consisting of—1st, the egg ; 2nd, an indefinite succession of viviparous *Aphides* ; 3rd, males and females eventually produced by these, and giving rise to the egg again.

If, armed with the microscope and scalpel, we examine into the minute nature of these processes (without which inquiry all specu-

lation upon their nature is vain), we find that the viviparous *Aphis* contains an organ similar to the ovarium of the oviparous female in some respects, but differing from it, as Von Siebold was the first to show, in the absence of what are termed the colleterial glands and the spermatheca,—organs of essential importance to the oviparous form.

In the terminal chambers of this “pseudovarium,” ovum-like bodies, thence called “pseudova,” are found. These bodies pass one by one into the pseudovarian tubes, and there gradually become developed into young, living *Aphides*. As Morren has well said, therefore, the young *Aphides* are produced by “the individualization of a previously organized tissue.”

The only organic operation with which this mode of development can be compared is the process of budding or gemmation, as it takes place in the vegetable kingdom, in the lower forms of animal life, and in the process of formation of the limbs and other organs of the higher animals. And the parallel is complete if such a plant as the bulbiferous Lily or the *Marchantia*, or such an animal as the *Hydra*, is made the term of comparison.

Thus agamogenesis in *Aphis* is a kind of internal budding or gemmation. If we inquire how this process differs from multiplication by true ova, or “gamogenesis,” we find that the young ovum in the ovarium is also, to all intents and purposes, a bud, indistinguishable from the germ in the pseudovarium of the agamogenetic *Aphis*. Histologically, there is no difference between the two; but there is an immense qualitative or physiological difference, which cannot be detected by the eye, but becomes at once obvious in the behaviour of the two germs after a certain period of their growth. Dating from this period, the pseudovum spontaneously passes into the form of an embryo, becoming larger and larger as it does so; but the ovum simply enlarges, accumulates nutritive matter, acquires its outer investments, and then falls into a state of apparent rest, from which it will never emerge, unless the influence of the spermatozoon have been brought to bear upon it.

That the vast physiological difference between the ovum and the pseudovum should reveal itself in the young state by no external sign, is no more wonderful than that primarily the tissue of the brain should be undistinguishable from that of the heart.

The phænomena which have been described were long supposed to be isolated; but numerous cases of a like kind, some even more remarkable, are now known.

Among the latter, the speaker cited the wonderful circumstances attending the production of the drones among bees, as described by Von Siebold; and he drew attention to the plant upon the table, *Cœlobogyne ilicifolia*, a female Euphorbiaceous shrub, the male flowers of which have never yet been seen, and which, nevertheless, for the last twenty years, has produced its annual crop of fertile seeds in Kew Gardens.

Not only can we find numerous cases of agamogenesis similar to that exhibited by *Aphis*, in the animal and vegetable worlds, but if

we look closely into the matter, agamogenesis is found to pass by insensible gradations into the commonest phænomena of life. All life, in fact, is accompanied by incessant growth and metamorphosis ; and every animal and plant above the very lowest attains its adult form by the development of a succession of buds. When these buds remain connected together, we do not distinguish the process as anything remarkable ; when, on the other hand, they become detached, and live independently, we have agamogenesis. Why some buds assume one form and some another, why some remain attached and some become detached, we know not. Such phænomena are for the present the ultimate facts of biological science ; and, as we cannot understand the simplest among them, it would seem useless, as yet, to seek for an explanation of the more complex.

Nevertheless, an explanation of agamogenesis in the *Aphis* and in like cases has been offered. It has been supposed to depend upon "the retention unchanged of some part of the primitive germ-mass," this germ-mass being imagined to be the seat of a peculiar force, by virtue of which it gives rise to independent organisms.

There are, however, two objections to this hypothesis : in the first place, it is at direct variance with the results of observation ; in the second, even if it were true, it does not help us to understand the phænomena. With regard to the former point, the hypothesis professes to be based upon only two direct observations, one upon *Aphis*, the other upon *Hydra* ; and both these observations are erroneous, for in neither of these animals is any portion of the primitive germ-mass retained, as it is said to be, in that part which is the seat of agamogenesis.

But suppose the fact to be as the hypothesis requires ; imagine that the terminal chamber of the pseudovarium is full of nothing but "unaltered germ-cells," how does this explain the phænomena ? Structures having quite as great a claim to the title of "unaltered germ-cells" lie in the extremities of the acini of the secreting glands, in the sub-epidermal tissues and elsewhere ; why do not they give rise to young ? Cells, less changed than those of the pseudovarium of *Aphis*, and more directly derived from the primitive germ-mass, underlie the epidermis of one's hand ; nevertheless, no one feels any alarm lest a nascent wart should turn out to be an heir.

On the whole, it would seem better, when one is ignorant, to say so, and not to retard the progress of sound inquiry by inventing hypotheses involving the assumption of structures which have no existence, and of "forces" which, their laws being undetermined, are merely verbal entities.

ZOOLOGICAL SOCIETY.

February 23, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

LIST OF SPECIES OF MAMMALIA SENT FROM THE ARU ISLANDS
BY MR. A. R. WALLACE TO THE BRITISH MUSEUM. By
DR. J. E. GRAY, F.R.S., V.P.Z.S., PRES. ENT. SOC., ETC.

Mr. A. R. Wallace has lately sent to Mr. Samuel Stevens a col-

lection of *Mammalia* and *Birds* from the *Aru Islands*, referred to in his paper on the *Natural History* of those islands in the 'Annals and Mag. Nat. Hist.' vol. xx. p. 473, 1857, which has been transferred to the *British Museum*, and forms a most important addition to the collection of that establishment.

His list does not contain a single *Bat*.

In the 'Zoology of the Voyage of H.M.S. *Samarang*' I gave a list of the *Mammalia* which had up to that period been found in *New Guinea* (p. 31); and in Dr. Müller's 'Verhandlingen' is a similar list.

Besides the animals sent home by Mr. Wallace from the *Aru Islands*, there are recorded in these lists—

1. *DENDROLAGUS URSINUS*.

Dendrolagus ursinus, S. Müller, Verh. 131, 141. t. 19. f. 22, 23.
Hypsiprymnus ursinus, Temm. Faun. Japon.

2. *DENDROLAGUS INUSTUS*.

Dendrolagus inustus, S. Müller, Verh. 131, 143. t. 20, 22, 23.

3. *DORCOPSIS ASIATICUS*.

Dorcopsis Brunii, Müller, Verhand. 131.
Dorcopsis Asiaticus, Gray, Voy. Sam. 32.
Filander or *Kangaroo*, Le Brun's Voyage, i. 347. t. 213, 1714.
Didelphis Asiaticus, Pallas, N. A. Petrop. 1777, 228. t. 9.
D. Brunii, Gmelin.
Halmaturus Brunii, Illiger, Prod.
Hypsiprymnus Brunii, Müller, Verh. 63. t. 21-23.
Island of *Aru*.

It is curious that this animal, described as specially inhabiting the island visited by Mr. Wallace, was not sent home by him. It is to be hoped that he did not neglect it, thinking it a common *Kangaroo*, as it is a desideratum in most museums in *Europe*.

The specimen of this animal in the *Leyden Museum* is said to be from the continent of *New Guinea*, where the two species of *Dendrolagus* and the *Antechinus melas* were also found.

4. *PHASCOGALE (ANTECHINUS) MELAS*.

Phascogale (Antechinus) melas, Müller, Verhand. t. 25. f. 1-3.
From *New Guinea*.

Differs, according to the figure, in having the hair of the tail rather more elongated and spreading than the *Australian* species of the genus; the dentition is more nearly allied to the *Antechinus* than to the new genus *Myoictis* sent home by Mr. Wallace.

5. *HALICORE AUSTRALIS*.

Halicore Australis, Owen in Jukes's Voyage of the Fly, ii. 323. f. 135, 1847; Gray, Voy. Samarang, 33.
Hab. *Timor Straits*.

6. *SUS PAPUENSIS*.

Sus Papuensis, Lesson, Voy. Coquille, t. ; Müller, Verh. t. .

Hab. New Guinea. Called 'Bene.'

A species which has not yet reached England.

The following animals sent home by Mr. Wallace do not occur in the list ; indeed it does not contain a single Bat : viz.—

1. *Hipposideros Aruensis*.
2. *Pteropus argentatus*.
3. *Dactylopsila trivirgata*.
4. *Myoictis Wallacii*.

VESPERTILIONIDÆ.

1. *PTEROPUS ARGENTATUS*.

Back white, with scattered black hairs ; beneath yellowish ; face grey, nakedish ; head deeper yellow-grey, with black interspersed hairs ; collar broad, bright red-chestnut, darker brown at the sides and under side, where the hair is longer, forming a kind of ruff ; ears and membranes (when dry) black.

Hab. Aru Island. Female.

"Back of a silky or silvery shining white, very beautiful in the freshly killed animals."—*Wallace*.

HIPPOSIDEROS.

As M. Bonaparte has given the name of *Phyllorhina* to the European Horse-shoe Bats, I am inclined to restrict the genus *Hipposideros* to those species of the larger genus which have a large cavity opening with an expanding pore on the forehead behind the transverse hinder part of the nose-leaf ; they have distinct pubal teats ; thus restricting *Phyllorhina* to those which have a simple forehead without any pore.

2. *HIPPOSIDEROS ARUENSIS*.

Sooty-brown ; the lower half of the hairs of the back paler ; the hairs of the under side more uniform, or with rather paler tips ; the ears large, broad, rounded at the ends, with two hairy lines on the inner side of the front edge ; face and chin rather bristly, without any membranaceous ridges on the sides outside of the nose-leaf.

Hab. Aru Islands. "Male."—*Wallace*.

Length of head and body 2" ; tail $\frac{5}{8}$; expanse of wings $5\frac{1}{4}$; length of upper arm bone $1\frac{1}{2}$; length of shin bone $\frac{5}{8}$ inch.

The ears sooty-black ; the front margin of the ears is broad, with a rounded lobe on the basal part near the forehead ; wings broad, thin, sooty-black, bald ; thumb slender, of two subequal joints ; the interfemoral membrane broad, truncate at the end ; the hind legs slender, rather elongate ; feet slender, enveloped in the membrane to the base of the slender equal compressed toes ; the heel-bones elongate, longer than the foot ; tail elongate, slender, attached and

extending a little beyond the end of the truncated interfemoral membrane.

Cutting teeth $\frac{1-1}{4}$; upper large, chisel-shaped, separated by a small space from each other and from the canines; the lower small, crowded, three-lobed; canines conical; grinders —?

The specimen is unfortunately rather injured about the face; but it appears quite distinct in form from any of the Horse-shoe Bats I have hitherto observed.

This species appears to be quite distinct from *Hipposideros speoris* of Timor, which is described as being a little larger than the larger English Horse-shoe Bat, *Phyllorhina bifer*; it has the following synonyma:—

Vespertilio speoris, Schneid. in Schreb. Säugth. t. 59 B.; Shaw, Zool. i. 147.

Rhinolophus marsupialis, Geoff. Cour. 1805.

Rhinolophus speoris, Geoff. Ann. Mus. xx. 261. t. 5. 266; Desm. N. D. H. N. xl. 368; Mam. 126; Fischer, Mam. 139.

Rhinolophe cruménifère, Péron & Lesueur, Voy. aux Terres Aust. Atlas, i. t. 35.

Hab. Timor (Péron and Lesueur).

It is certainly distinct from *Hipposideros insignis*, Gray, Mag. Zool. & Bot. ii. 492, the *Rhinolophus insignis*, Horsf. Java, *Vesp. cyclope*, Deschamps, MSS., from Java, which Fischer confounded with the former, and which has acute ears on the sides of the face, numerous lamellæ under the front part of the nose-leaf, and is $13\frac{1}{2}$ inches in expanse of wings.

Fam. MACROPODIDÆ.

3. CUSCUS MACULATUS.

Phalanger, male, Buffon, H. N. xiii. t. 11.

Phalangista maculata, Desm. N. D. H. N. xxv. 473; Quoy & Gaim. Voy. Astrol. t. 7.

Cuscus maculatus, Lesson & Garnot, Voy. Coq. Zool.

Cuscus macrourus, Lesson & Garnot, Voy. Coq. Zool. 150. t. 4.

Grey or black and white, variegated, without any dorsal streak.

Hab. Aru Island.

Two skulls, male.

The specimen sent is white, with scattered black spots, more abundant on the middle of the back and sides.

4. CUSCUS ORIENTALIS.

Cuscus Quoyii, Lesson, Mam. 220.

♀ *Phalangista Quoyii*, Quoy & Gaimard, Voy. Uranie, Zool. 38 (t. 6? ?).

P. maculata, part., Waterhouse, Mamm. i. 274.

P. Papuensis, Desm. Supp. 341.

Brown, grizzled, with a few white-tipped hairs, with a narrow black dorsal streak.

Hab. Aru Island. "Female," young.

5. *BELIDEUS ARIEL*.*Belidea Ariel*, Gould, Proc. Zool. Soc. 1842, x. 11.*Petaurus sciureus*, Müller, Verhand. tabl.*Hab.* Aru Island.

Female adult, with one young in the pouch.

DACTYLOPSILA.

Tail elongate, slender, depressed, densely clothed with fur, with the exception of the under side near the tip, which is bald and callos, the end rather bushy. Ears elongate, rounded, bald, except at the outer sides of the base. Pupil round? The fore-feet elongate; toes very slender, compressed, very unequal in length, quite free; the outer and third or middle toe nearly equal, the second much the longest, the fourth and fifth short, the fifth or innermost the shortest. The hind-feet slender, toes compressed, the two outer toes elongate, nearly equal, the two inner about half the length and united.

Skull (figs. 1, 2, 3) depressed, very broad, with very large expanded zygomatic arches; the face narrow, compressed and nearly erect on the sides, tapering in front; the palate narrow, concave. The cutting teeth $\frac{4-4}{4-4}$; the upper front elongate, projecting in front, rather tapering and truncated at the tip; the second and third compressed, chisel-shaped, close together and to the front; the second small, the third larger; the fourth separated from the others by a small space and

Fig. 1.

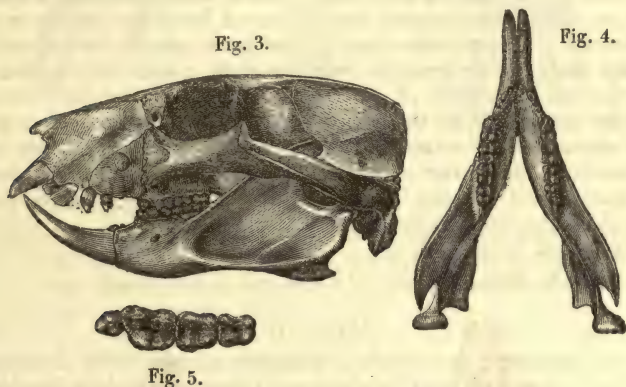


Fig. 2.



placed on the intermaxillary suture, compressed, curved rather like a canine; the lower front very long, projecting in front, curved, rather tapering at the tip; the second, third and fourth small, truncated, separated from each other; the second largest, close to the base of the front tooth; the third small, separated from the second by a small space; the fourth very small, far from the other; and at the base of the front edge of the first grinder; in the space between the

third and fourth on the right side of the jaw, is a cavity which appears to have been filled with a tooth like the third one, but there is no appearance of the tooth or cavity on the other side. Canines? $\frac{1-1}{0-0}$, upper small, compressed, conical, tapering like, but smaller than, what I have called the hinder cutting teeth (fig. 3). Grinders $\frac{5-5}{4-4}$, small, in two nearly straight lines parallel to each other, and the hinder ones in each jaw rather smaller than the front ones; the front upper small, triangular; the others four-sided and square, with four tubercles, the outer front tubercle of the second tooth being rather larger than the rest, which are nearly equal among themselves, and the front lower grinder has only one larger tubercle in the place of the two in the others (figs. 4, 5).



This genus is very distinct from the other genera of *Phalangistina*, in the elongated and depressed form of the tail, the formation of the fore-feet, and especially in the disposition and form of the teeth, as well as in the broad depressed skull.

The following observations may assist in showing the value of these characters.

In *Cuscus* the fingers are rather longer than in *Hepoona*, and the third or middle finger is the longest, the others becoming gradually shorter on each side.

In *Phalangista* proper (that is *Trichosurus* of Mr. Waterhouse) the fingers are moderately long, the second and third are the longest and equal, the fourth longer than the first, and the fifth or inner one the shortest.

The hand of the *Hepoona* is very like that of *Phalangista*, both in the proportion and form of the fingers; but the two inner fingers are rather separated and opposable to the other three.

The tail, though covered with hair, is very unlike those of the genera *Hepoona* and *Phalangista*, and is more like that of a squirrel, but not so bushy; in *Hepoona* it is tapering and covered with shortish hair, and has a slender tip; in the more perfect specimen

of *Phalangista* it is cylindrical and equally covered with hair on all sides.

In *Hepoona* and *Phalangista* the grinders are placed in arched series, and they are much larger compared with the size of the skull than in this genus, and the hinder grinders are larger than the front ones; the front grinder in the upper jaw is larger, more elongate, and compressed.

6. DACTYLOPSILA TRIVIRGATA.

White; three broad black stripes on the back, the outer ones commencing on the side of the nose, enclosing the eyes, and continued along the side of the back; the central one commencing on the crown and continued to the end of the tail, being narrower at the base of the tail: a large black square spot on each side of the chin, separated by a narrow central line; a large spot on the upper surface of each leg; the sides of the throat greyish, and the sides of the body rather greyish from the dark colour of the base of the fur on that part of the body; the tip of the tail whitish, and the under part of the upper surface near the tip, with a narrow streak ending some way down the middle of the under side of the tail, black; the under side of the tip of the tail is bald, but scarcely callous; the feet flesh-coloured, with few scattered short whitish hairs; the ears nakedish, black when dry.

Hab. Aru Island.

A female: lives on fruit. "Teeth $\frac{20}{18}$." (*Wallace.*)

MYOICTIS.

Head tapering; nose acute; whiskers strong. Tail depressed, tapering, clothed with rather elongated hairs above and on the sides; the under side flat, nakedish. Feet moderate; soles bald to the heel; toes 5·5, free, compressed; claws acute; first and fifth front toes equal; second, third and fourth toes equal, longer; hinder toes free, weak, distinct, clawless; thumb of hind-foot larger. Ears roundish, nakedish. Scrotum pendulous.

Cutting teeth $\frac{4-4}{6}$; the upper with a central space in front between them, in a close series on each side, and with a small interspace between them and the canines; the first tooth very small, hidden in the gums, the others all equal, lancet-shaped, rather crowded; the lower forming a continued series, shelving forward, all lancet-shaped, subequal; the front rather the longest and narrowest; the hinder rather broader.

Canines $\frac{1-1}{1-1}$, conical; the upper not quite developed, only slightly produced above the level of the other teeth; the lower small, conical, scarcely raised above the other teeth (figs. 8, 9).

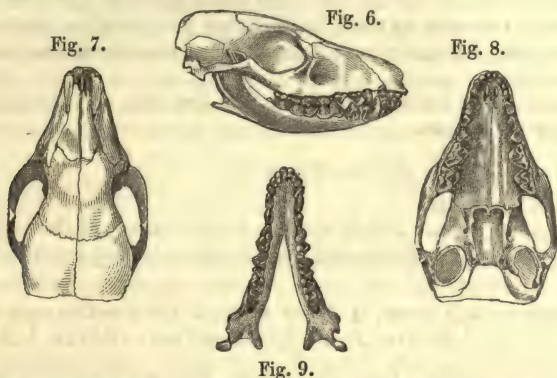
False grinders, $\frac{2-2}{2-2}$, conical, compressed; the lower with a very obscure, the upper with a rather more distinct, conical tubercle on the front and hinder edge (figs. 8, 9).

True grinders $\frac{2-2}{3-3}$; the upper large, triangular, acutely lobed;

the lower compressed, very acutely lobed; the middle one in each jaw the largest.

The angle of the lower jaw is produced, elongate and strongly inflexed, as is usual in *Marsupialia*.

Skull: length, 1 inch 3 lines; width, all the zygomatic arch, 9 lines; length of the tooth-line 9 lines. Length of the lower jaw $11\frac{1}{2}$, of symphysis $4\frac{1}{2}$, of tooth-line $7\frac{1}{2}$ lines (figs. 6-9).



This genus is peculiar, because, as far as the dentition is concerned, there is no character by which we should have determined that it was a Marsupial animal; but the form of the angle of the lower jaw at once shows its true affinity to that group. It was not until a most careful examination of the space between the front upper cutting teeth, that I could find any indication of the front pair of cutting teeth found in the allied genus *Antechinus*.

This genus is evidently allied to the genus *Antechinus* of Australia; but it is known at once by its external form, which is just that of a small Indian *Herpestes* or *Ichneumon*, having like that genus a depressed tail with long spreading hair, broad and depressed at the base, tapering to an acute tip which bears a pencil of hairs.

7. *MYOICTIS WALLACII*.

Rusty-brown, with interspersed black longer hairs; head redder; throat, chest and belly pale reddish; side of the neck at the base of the ears bright reddish; ears, and the greater part of the tail bright red-brown; tip of the tail black.

Hab. Aru Island.

Male.

"In houses as destructive as rats to every thing eatable.

"Teeth 34:—Inc. $\frac{6}{6}$; C. $\frac{1-1}{1-1}$; Prem. $\frac{2-2}{2-2}$; M. $\frac{2-2}{3-3}$."—*Wallace*.

8. *PERAMELES (ECHIMIPERA) DOREYANUS*.

Perameles Doreyanus, Quoy & Gaimard, Voy. Astrol. Zool. i. 100. t. 16. f. 1-5; Waterhouse, Mamm. i. 386.

Echymipera Kalulu, Lesson, Règne Anim. 192.

Tail naked, rugose, squamose, wrinkled below. Toes 3·5: the

two inner front large, equal; the outer small; the inner hind toe short, clawless; the two index fingers small, united, clawed.

Hab. Aru Island.

Female.

"The skin is very thin and friable.

"Teeth 46:—Inc. $\frac{8}{6}$; C. $\frac{1-1}{1-1}$; Prem. $\frac{3-3}{3-3}$; M. $\frac{4-4}{4-4}$."—*Wallace*.

This enumeration agrees with that given by MM. Quoy and Gaimard, being two cutting teeth in the upper jaw less than are found in the other species of the genus; hence Lesson considered it as forming a distinct genus.

The outer and inner toes of the fore-feet are very small, rudimentary and clawless.

9. PARADOXURUS HERMAPHRODITA.

Hab. Ké Islands.

Is in the collection: it only appears to be a variety of the very variable and extensively distributed *Paradoxurus hermaphrodita*.

ON APHROCALLISTES, A NEW GENUS OF SPONGIADÆ FROM MALACCA. BY DR. JOHN EDWARD GRAY, F.R.S., V.P.Z.S.

In 1842 we received from Captain Sir Edward Belcher a Sponge which he obtained in Malacca, which evidently forms a new genus nearly allied to the *Euplectella* of Professor Owen. I therefore have great pleasure in bringing a description of it before the Society.

APHROCALLISTES.

The sponge cylindrical, tubular, branched; the end of the main tube closed with an open network formed of spicula; branches cylindrical, simple, rarely bifid, rounded and closed at the end; the inner surface of the tube with large unequal-sized concavities placed in longitudinal series, having a large roundish oscule near its lower edge.

The sponge hard, calcareous, with uniform, close, equal, regular hexangular pores on the surface, and larger round ostioles in series on the sides of the main tube. The outer surface formed of intertangled transparent spines, which inosculate and unite with each other at their intersections, forming a hard, rather brittle crust. The inner surface lined with a coat of fusiform transparent spicula, which are placed in bundles parallel to each other in the spaces between the roundish internal apertures of the crowded small superficial pores.

This genus is very like *Euplectella* of Professor Owen in its external form, and especially in the upper part of the tube being closed with network.

It differs from that genus in being more irregularly formed and branched, and in the structure and calcareous composition of the sponge itself.

In that genus the basis of the tube is formed of ropes of elongated spicula placed at right angles longitudinally and transversely to the

axis of the tube, and covered with a more or less thick coat of smaller spicula. In this genus the mass of the sponge is formed of small spicula, which inosculate and are united together, forming a rather hard mass pierced with numerous closed, small, uniform hexangular pores, lined internally with a thin layer formed of elongate fusiform spicula placed parallel in bundles in a more or less longitudinal direction round the inner mouth of the pores.

The main tube is smaller at the base, gradually enlarges upward, and is then subcylindrical and irregular on the surface.

When examined externally, eight or ten longitudinal ridges are observed, between which are placed a more or less regular series of unequal-sized squarish concavities; at the lower edge of each is to be observed a large round oscule, commencing with the outer surface.

APHROCALLISTES BEATRIX.

Hab. Malacca.

We have in the British Museum an imperfect specimen of *Euplectella*, which was brought home by Capt. Sir Edward Belcher at the same time as the above.

March 9, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

ON SOME NEW OR LITTLE-KNOWN SPECIES OF ACCIPITRES, IN THE COLLECTION OF THE NORWICH MUSEUM. BY PHILIP LUTLEY SLATER, M.A.

At the request of Mr. J. H. Gurney, I exhibit to the meeting some interesting birds belonging to the fine series of specimens of the order Accipitres, which that gentleman has collected for the Norwich Museum. Among them appear to be several new or little-known species, concerning which I beg to offer the following remarks:—

1. URUBITINGA SCHISTACEA.

Asturina schistacea, Sund. Ofv. Af. K. Vet. Ak. Förh. 1849, p. 132.

Falco ardesiacus, Licht. in Mus. Berol.

Morphnus schistaceus, Slater, P. Z. S. 1857, p. 261.

♂ *adultus*. *Totus nigro-cinerascens: cauda nigra, fascia media angusta margineque apicali albis: orbitis subnudis: rostri apice nigra, hujus basi cum pedibus flavis.*

Long. tota 16·0, alæ 11·0, caudæ 7·0, rostri a rictu 1·4, tarsi 3·3.

Sundeval has given an excellent description of this bird, which does not appear to have been recognized by any other writers except Prince Bonaparte. By this author it is alluded to in an article entitled "Revue générale de la classe des Oiseaux," in the 'Revue et Mag. de Zool.' for 1850, p. 474, and again in the 'Comptes Rendus' for 1855, under the specific name *ardesiacus*, the synonym "*Falco ardesiacus*, Licht. in Mus. Berol." being said to refer to it.

Of the two examples of this species belonging to the Norwich Museum, one was procured by Mr. H. W. Bates* on the Rio Javarri—a branch of the Upper Amazon; and the other, I have no doubt, from the ticket with which it is labelled, is from the interior of Bolivia. So we may conclude that the interior wood-region of Peru and Bolivia is the natural *habitat* of this species.

There are at least three birds of this group which are in their adult plumage slaty-black or blackish, with a white bar across the tail. The first of these and largest in size is the *Falco urubitinga* of the older authors. Lesson in 1839 proposed to convert the term *Urubitinga* into a generic name, and it was so adopted by Lafresnaye in 1842, before the creation of Cabanis's genus *Hypomorphnus* for the same type. See M. de Lafresnaye's remarks on this subject in the 'Revue Zoologique' for 1848, p. 240. With regard to the specific name to be employed for this bird, we cannot use Brisson's "*brasiliensis*," as is done in Strickland's 'Ornithological Synonyms,' because Brisson's† names are not to be employed in a binominal system of nomenclature. Nor is it proper to adopt Illiger's MS. term "*longipes*," as proposed in Prince Bonaparte's 'Conspectus,' while there are many other names for this bird already published. So the earliest specific name available seems to be Shaw's *zonurus* (*Falco zonurus*, Shaw's Zool. vii. p. 62), and this species should stand as *Urubitinga zonura*. It appears to have an extensive range, extending from Paraguay, all over Bolivia, Peru, Brazil, Guiana and New Granada into Southern Mexico, where specimens were obtained by M. Sallé.

The second allied species of *Urubitinga* is the "*Falco anthracinus*, Licht. in Mus. Berol.," under which name it is described by Nitzsch in a note to his 'Pterylographie' (p. 83). This is the same as Du Bus's *Morphnus mexicanus* (Bull. Ac. Brux. 1847). See M. de Lafresnaye's observations in the 'Revue Zoologique' for 1848 (p. 240), where he clearly points out the differences between this bird and the *Urubitinga zonura*. The *Urubitinga anthracina* inhabits the northern portion of South America, Guiana‡ and New Granada§, Guatemala and Southern Mexico||, where MM. Botteri and Sallé both procured it, and M. Du Bus's types were collected. The third species is *Urubitinga schistacea* as characterized above, which is distinguishable at once from the preceding by its inferior size and narrower tail-band. The following diagnoses are sufficient to point out the differences between these three species ¶:—

1. *U. zonura*. *Major, caudæ dimidio basali et margine apicali albis.*

* See P. Z. S. 1857, p. 261.

† See British Association's Report on Zoological Nomenclature, rule 2, p. 5.

‡ Schomburgk, Reisen in Britisch Guiana, iii. p. 740.

§ MM. Verreaux have received examples from Santa Martha.

|| See P. Z. S. 1857, pp. 211 & 227.

¶ A fourth black *Urubitinga*, allied to *U. anthracina*, has lately been described by Cabanis from Cuba under the name *Hypomorphnus Gundlachii*. See Cab. Journ. f. Orn. 1854, Erinnerungs-heft, p. lxxx.

2. *U. anthracina*. *Media, caudæ fascia lata et margine apicali albis.*

3. *U. schistacea*. *Minor, caudæ fascia angusta et margine apicali albis.*

Such are these birds in their adult plumage: in their immaturity they are quite different. I have not yet seen the young of *U. schistacea*, as I now think the specimen in one of Sallé's Mexican collections called *Morphnus schistaceus*, juv. (P. Z. S. 1857, p. 227) does not really belong here; but the other two species in their immature state are both irregularly flammulated on the lower surface and back, and have numerous buffy-white cross-bars on the tail and under tail-coverts. Specimens of *U. zonura* in this state are in the British Museum, and we have a fine example of a similar bird now alive in our Gardens.

I have hitherto used for these birds the generic term *Morphnus*, following Mr. G. R. Gray and other writers; but on considering that the true type of *Morphnus* is the *Falco guianensis* of Daudin—a bird of different structure and more nearly allied to *Thrasaëtus*—I think they stand better disconnected. But the *Falco unicinctus* of Temminck and *Falco meridionalis* of Latham—two allied species—for which Kaup's term *Spizigeranus* may be employed subgenerically—ought, as M. de Lafresnaye* has observed, to come close to the true *Urubitingæ*; and *Buteogallus* with its two species (*æquinoctialis* and *nigricollis*) follows next. A bird more closely corresponding to the *Urubitingæ* in its changes of colouring is *Urubitornis solitaria*, of which M. Jules Verreaux has described the several stages of plumage in the Society's 'Proceedings†'; but it is distinguishable by its shorter and much more robust tarsi.

2. Buteo zonocercus, sp. nov.

Schistacescenti-niger unicolor, alis extus brunnescente tinctis: remigum pogonius interioribus albo obsolete transfasciatis: cauda nigra; vitta inferiore lata, et alteris duabus superioribus angustioribus et imperfectis cum margine apicali albis: rostro nigro, cera aurantia, pedibus flavis.

Long. tota 17·0, alæ 14·7, caudæ 7·5, rostri a rectu 1·3, tarsi 2·9.
Hab. Guatemala.

In plumage this bird is very much like the typical *Urubitingæ*, being of a nearly uniform ashy-black, tinged with brown on the scapularies and secondaries, and with a broad white band across the tail. Above this are two other bands, much narrower and not quite complete, and the tail is likewise tipped with white. The colour of these bands is pure white on the under surface; on the upper surface it is cinereous on the outer webs of the lateral rectrices, and on both webs of the medial pair, but pure white on the inner webs of the lateral tail-feathers. The lowest band is about $1\frac{3}{4}$ inch in breadth, the second not half an inch, and the highest is quite narrow. There are distinct traces of white cross-bands on the inner

* Rev. Zool. 1848, p. 240.

† See P. Z. S. 1856, p. 145.

webs of the wing-feathers. The wings are, however, much more elongated than in the *Urubitingæ*, the third primary (which is longest) extending 4 inches beyond the secondaries. The fourth and fifth primaries are only slightly shorter than the third, the first being nearly of the same length as the longest secondary. The general form seems to be that of the *Buteones* appertaining to the subgenus called *Tachytriorchis*, and the nearest ally of the present species among the specimens of the British Museum appears, as has been pointed out to me by Mr. G. R. Gray, to be his *Buteo albonotatus* (Cat. Accipitres [1848], p. 36). This latter bird does not appear to me to differ from Cabanis's *Buteo abbreviatus*, described in Schomburgk's 'Reisen in Britisch Guiana,' vol. iii. p. 739, and I should be inclined to consider the two names as synonymous.

3. SYRNIUM ALBITARSE, sp. nov.

Syrnium albotarse, G. R. Gray in Mus. Brit.

Supra brunnescenti-nigrum, plumis omnibus pallido rufo semel aut pluries late transfasciatis; pileo unicolore nigricante, plumis subtus pallide rufis: alis caudaque nigricantibus; remigum pogoniis exterioribus quinque sive sex maculis quadratis pallide rufis marginatis; rectricibus vittis quinque et altera terminali latiore supra pallide rufis, subtus magis albidis apparentibus transfasciatis: facie, loris, mento et plumis supra-ocularibus albis: subtus pure album, rufescente mixtum, plumarum terminationibus latis interdum etiam scapis saturate brunneis; tibiis et tarsorum parte superiore rufis, horum parte inferiore albis: rostri plumbei apice flava, pedibus fuscis.

Long. tota 15·0, alæ 11·0, caudæ 6·5, tarsi 1·9.

The name of this Owl was inserted in the list of specimens of Accipitres in the collection of the British Museum published in 1848; but no description of it has yet appeared. The type in the British Museum is immature, and nearly agrees with one in my own collection. Mr. Gurney's specimen, from which my description is taken, appears to be nearly adult. All these three examples were received in collections from Bogota, and they are the only individuals of this species that I have yet met with. The face of this bird is white; the head above brownish-black outside, with the bases of the feathers bright rufous. The whole upper surface is brownish-black varied with this rufous colouring, every feather being crossed with a broad subterminal band of rufous, sometimes with a second, and these bands being occasionally incomplete in the middle across the shaft. The primaries and secondaries are marked externally with rather square-shaped rufous spots, four or five in number. The tail has five cross-bands besides the terminal one formed in the same way, which bands appear whitish on the lower surface. Below, the colouring is creamy-white tinged with pale rufous, the breast-feathers, particularly on the sides, having broad terminations of black-brown, the belly-feathers narrower terminations and also lateral margins of the same colour. The tarsi are creamy-white with

a yellowish tinge in both my specimens, more nearly pure white in that in the British Museum. They are thickly feathered down to the fissure of the toes. The form is that of other South American *Syrnia*, the fourth and fifth wing-feathers being equal and longest, only slightly exceeding the third. The specimen which I take for the younger bird only differs in having the head varied like the back, and being generally more rufous.

4. SCOPS USTA, sp. nov.

Supra saturate castaneo-brunnea, plumis omnibus nigro subtilissime vermiculatis: facie et gula pure castaneo-brunneis, hac pallidiore: linea post regionem auricularem, cornuum capitis extantium marginibus latis et pileo supero nigris: alarum pennis pallide castaneo-brunneis nigro punctulatis, intus autem ochraceo-albidis, quinque aut sex fasciis latis in pogonio externo, maculas quadratas efficientibus, nigris transvittatis; cauda ex eodem colore sed fasciis nigris pæne obsoletis: subtus clarius brunnea, lineis angustis longitudinalibus, scapas plumarum occupantibus, nigris parce notata: tectricibus alarum inferioribus sordide albis: tarsis pallide fulvis: rostro et pedibus flavis.

Long. tota 8·5, alæ 7·0, caudæ 4·0, tarsi 1·2.

Hab. Ega on the Upper Amazon (H. W. Bates).

This species is distinguishable from every other South American member of the genus, as far as I am acquainted with them, by its rich brown colouring above and below, and by the longitudinal lines below not being crossed as in *Scops choliba* and *S. atricapilla*.

REMARKS ON THE BRITISH ACTINIADÆ, AND RE-ARRANGEMENT OF THE GENERA. BY W. THOMPSON.

Observations extending over many years, on the characters and the habits of the British species, clearly proved to me that the genera of British *Actiniæ* required great alterations; and I submit the present classification as an improvement on those hitherto adopted.

It is well understood that the principal generic characters are derived from modifications and differences existing in the tegumentary system and in the tentacula. Dr. Johnston, in his 'History of British Zoophytes,' published in 1847, made but one British genus, *Actinia* of Linnæus, and in this he included all known British species; but he divided it into two sections or subgenera, the one characterized by having the skin smooth, the other by having the skin covered with porous warts. Mr. Gosse, in a paper read before the Linnæan Society in the early part of 1855, divided the family into three genera; namely, *SAGARTIA*, destitute of warts, and emitting filaments from pores; *BUNODES*, studded with warts, and without pores and filaments; and *ACTINIA*, having a perfectly smooth skin, and destitute of warts, pores or filaments. The character arising from the presence or absence of filaments is not of very great weight,

inasmuch as the presence of filaments depends entirely on the presence of pores in the skin, and through which they are extruded; consequently, when there are no pores there are no filaments.

These genera comprised species possessing characters so different from each other, and so well established, that I found they must not remain united. For instance, the genus *Sagartia* included, amongst others, *A. dianthus*, *A. bellis* and *A. parasitica*; but although the characters were useless as generic distinctives, yet they appear to me to be of sufficient importance to be used as characters for the division of the *Actiniadæ*, and I have accordingly used them for that purpose.

On examining Milne-Edwards's 'Histoire des Corallières,' I was pleased to find that my views on this point were in accordance with those of that naturalist, he having divided the family into three sections, which he calls respectively *Smooth Actinia*, *Warty Actinia*, and *Perforated Actinia*, or with pores, each being equal to one of Mr. Gosse's genera and my subdivisions. The true generic characters of the *Actiniadæ* are to be found (as I have already mentioned) in the integuments and in the tentacula; these latter, although varying with age, are yet constant in form and number in adults of the same species. From these characters amongst others, I had divided the family into eight genera (exclusive of *Anthea* and *Adamsia*), of which the types were *Actinia equina*, *A. gemmacea*, *A. clavata*, *A. bellis*, *A. viduata*, *A. dianthus*, *A. parasitica* and *A. coriacea*; and these I named respectively *Actinia*, *Bunodes*, *Cyrtactis*, *Heliactis*, *Sagartia*, *Actiniloba*, *Aster*, and *Cribrina*. My divisions and genera were formed from examinations of British species only, and I was not a little surprised to find that they so closely accorded with Milne-Edwards's labours, founded as they are on an examination of all described species. The only genus containing a British species that I have not verified is his genus *Dysactis*, in which he includes *A. biserialis*. This species, however, was described by the late Professor Forbes as occurring plentifully on the shores of the island of Herm; I have therefore admitted it as a genus on the authority of Milne-Edwards. The British species are distributed amongst six of his genera, namely, *Metridium*, *Actinia*, *Paractis*, *Dysactis*, *Cereus*, and *Adamsia*; of these, *Actinia* is the same as mine, *Paractis* I have used in lieu of *Sagartia*, and *Dysactis* I also admit unaltered—they are represented by *Actinia equina*, *Actinia viduata*, and *Actinia biserialis*. My genus *Actiniloba* is the same as his genus *Metridium*, and includes *Actinia dianthus*. I retain *Actiniloba*, as being the most characteristic name. His genus *Cereus* includes *A. coriacea*, *A. gemmacea*, *A. clavata* and *A. bellis*; these species, it was quite evident, could not be included in one genus; indeed M.-Edwards divides his genus *Cereus* into several sections, *A. coriacea* being in one section, *A. gemmacea* and *A. clavata* in a second, and *A. bellis* in the third. Restricting, therefore, his genus *Cereus* to *A. gemmacea*, instead of retaining Mr. Gosse's name *Bunodes*, I retain my division of the remainder of the species under the generic names of *Cribrina*, *Cyrtactis* and *Heliactis*. His genus *Adamsia* includes *Actinia parasitica* and *Adamsia palliata*,

two very dissimilar species. No one, I am sure, who has ever seen these Polypes would imagine for an instant that they can possibly belong to the same genus; and indeed the fact that *Adamsia palliata* secretes a horny base, an incipient polypidom, induces me to suggest the necessity of forming on its characters a distinct family. I have therefore constituted a genus for the reception of *Actinia parasitica*, and withdrawing the suggested name *Sagartia* from the genus that will now stand as *Paractis*, I have transferred it to this genus. The genus *Adamsia* I at present retain under the family *Actiniadæ*; and without entering into the question in this paper as to its proper position, I would suggest that it will eventually be placed between the Polypes that secrete a polypidom and those without a polypidom.

Of late years *Adamsia palliata* has so decreased in this locality, that I have seen but one since the severe winter some three or four years ago; this was given me in September last by my friend Mr. Busk, and is still alive and well in one of my tanks, but too valuable to submit to the dissecting knife. I trust this summer to obtain other specimens, when I hope to settle its proper position amongst the Anthozoa.

As regards species, I refrain from touching on that point in the present paper, but purpose doing so at an early period, when a careful examination of a larger number of individuals shall enable me to speak with authority as to which are *bond fide* species and also those that are merely varieties. The rage for marine vivaria has thrown many useless workers into the field; and I much fear that what may possibly tend to a love of nature does not always as a matter of course advance science. The improper multiplication of species is a serious injury to the well-being of Natural History; and, I must admit, I should like to see a council formed of five, ten, fifty, or any number of the most celebrated naturalists, and that no new species or arrangement should be published without their consent being first obtained. This would effectually prevent varieties and deformities creeping in as species, and objects already described and known being reproduced as new species, or, may be, even as new genera.

Proposed rearrangement of British Actiniadæ, with a revision of the genera:—

ANTHOZOA, Owen.

Body soft, contractile, in every part symmetrical. Tentacles hollow, possessing thread-cells, and in most with pectinated margins, in uninterrupted circles or groups. Stomach suspended by radiating mesogastric folds in an abdominal cavity. No intestine; mouth and vent generally one, placed in the centre of the upper disk, very dilatable. With or without polypary; when present usually internal.

Without polypary.

ACTINIADÆ.

Free and solitary, or gregarious. Tentacles simple, rarely branched

or clavate, more than twelve, often in more than one row in uninterrupted circles. Body single, fleshy, elongate or conical, fixed by its base, and generally with the power of locomotion. Base broad and adherent.

A. *Body without warts or pores; skin smooth.*

ANTHEA, Johnston.

Body adherent, cylindrical, smooth, without tubercles on the edge of disk. Tentacles numerous, elongated, taper, flaccid, scarcely retractile, longer than diameter of disk.

Type, *Anthea cereus*.

ACTINIA, Linnæus.

Body smooth, conoid or cylindrical. Tentacles numerous, in one or more uninterrupted circles, conical, undivided, subequal and entirely retractile, shorter than diameter of disk; margin of upper disk furnished with a row of tubercles.

Actinia mesembryanthemum.

PARACTIS, M.-Edw.

Body smooth, conoid or cylindrical. Tentacles few in number, in one or more uninterrupted circles, conical, undivided, subequal, filiform, very long. No tubercles on the edge of the upper disk.

Actinia viduata.

DYSACTIS, M.-Edw.

Tentacles forming two distinct circles, continuous at their base, those of the inner row three times as long as the outer row, numerous, short and subequal. Margin of disk without tubercles.

Actinia biserialis.

B. *Body studded more or less with verruciform tubercles or sucking-glands.*

CRIBRINA, Ehrenb.

Body studded with glandular warts irregularly placed, suctorial, distributed over the whole surface of the body. Tentacles short, thick, obtuse, subequal, very numerous.

Actinia coriacea.

CEREUS, M.-Edw.

Body with glandular warts placed in vertical lines and unequal. Tentacles not numerous, chiefly marginal, much spread and bent, conical, rather stout; length about equal to diameter of disk.

Actinia gemmacea.

CYRTACTIS, mihi.

Body rough, with sucking-glands in close-set perpendicular ridges or vertical rows, and all equal, the whole height of the body. Centre

of disk much more raised than the edges. Disk greater in diameter than the pillar of the body. Tentacles long, moderately slender, generally horizontal to the disk, mostly marginal, their tips constantly curled back.

Actinia clavata.

HELIACTIS, mihi.

The glandular warts placed only on the upper portion of the body. Tentacles very numerous, short, varying in length, crowded towards the edge of the disk, and of moderate thickness; oral disk much expanded.

Actinia bellis.

C. Body without glandular warts, and with pores for the passage of thread-cells.

ACTINILOBA, Blainv.

Skin soft; disk very large. Tentacles very numerous, short, varying but little in length, and forming a thick filamentous fringe; margin of disk lobed.

Actinia dianthus.

SAGARTIA, Gosse.

Skin coriaceous, occasionally wrinkled, firm to the touch. Tentacles numerous, not particularly long, retractile, having great power of elongation. Base broad and circular. Body cylindrical. Pores situated near the base, and varying in size. Parasitic.

Actinia parasitica.

ADAMSIA, Forbes.

Skin soft. Tentacles scarcely retractile, short. Base when young circular, afterwards expanding laterally until the extreme points meet, and form a circle. Disk circular or oblong according to the form of the base. Base secreting a horny membrane. Body much depressed, not cylindrical.

Adamsia palliata.

MISCELLANEOUS.

The Animals of Millepora are Hydroid Acalephs, and not Polyyps.

By Prof. AGASSIZ (from recent letters to J. D. DANA).

"I HAVE seen in the Tortugas something very unexpected. *Millepora* is not an Actinoid polyp, but a genuine Hydroid, closely allied to *Hydractinia*. This seems to carry the whole group of Favositidæ over to the Acalephs, and displays a beautiful array of this class from the Silurian to this day."

The drawings of Professor Agassiz which have been sent us for examination are so obviously *Hydractiniæ* in most of their characters, that no one can question the relation. With regard to the reference of *all* the Favositidæ (a group including *Favosites*, *Favistella*, *Pocil-*

lopora, &c., as well as the minuter *Millepora*, *Chaetetes*, &c.) to the Acaleph class, direct evidence is not yet complete, as the animal of the *Pocillopora* has not been figured by any author on Zoophytes*. On this point Professor Agassiz states in a subsequent letter, after observing that the *Sideropora* obviously are polyps:—

“There are two types of radiating lamellæ, which are not homologous. In true Polyps (excluding Favositidæ as Hydroids) the lamellæ extend from the outer body-wall inward, along the whole height of that wall, and the transverse partitions reach only from one lamella to the other, so that there is no continuity between them, while the radiating lamellæ are continuous from top to bottom in each cell. In Milleporidæ the partitions are transverse and continuous across the cells, and so are they in *Pocillopora* and in all *Tabulata* and *Rugosa*; while the radiating lamellæ, where they exist, as in *Pocillopora* and many other Favositidæ, rise from these horizontal floors, and do not extend through the transverse partitions; indeed they are limited within the spaces of two successive floors, or to the upper surface of the last. A careful comparison of the corallum of *Millepora* and *Pocillopora* with that of *Hydractinia* has satisfied me that these radiating partitions of the Favositidæ, far from being productions of the body-wall, are foot-secretions, to be compared to the axis of the *Gorgonia*, *Corallium*, &c., and their seeming radiating lamellæ to the vertical grooves or keels upon the surface of the latter, which, reduced to a horizontal projection, would also make the impression of radiating lamellæ in the foot of the polyp. If this be so, you see at once that the apparent radiating lamellæ of the Favositidæ no longer indicate an affinity with the true Polyps, but simply a peculiar mode of growth of the corallum; and of these we have already several types,—that of Actinoids, that of Halcyonoids, that of Bryozoa, that of *Millepora* and other Corallines, to which we now add that of the Hydroids. Considering the subject in this light, is there any further objection to uniting all the Favositidæ with the Hydroids,—*Sideropora* and *Alveopora* being of course removed from the Favositidæ? It is of great importance in a geological point of view, and for years I have been anticipating some such result, as you may see by comparing my remarks in the ‘American Journal,’ May 1854, p. 315. If all the *Tabulata* and *Rugosa* are Hydroids, as I believe them to be, the class of Acalephs is no longer an exception to the simultaneous appearance of all the types of Radiata in the lowest fossiliferous formations, and the peculiar characters which these old Hydroid corals present appear in a new and very instructive aspect.”—*Silliman's Journal*, July 1858.

* From the specimens of the species of this genus which I procured in the Pacific, I never obtained a clear view of the polyps, and hence made no figure. The brief description on page 523 of my Report may be reasonably doubted until confirmed by new researches. The much larger size of the cells in *Pocillopora*, *Favosites*, and *Favistella* than in *Millepora*, and the frequently distinct rays in these cells, are the characters I had mentioned to Prof. Agassiz as suggesting a doubt as to their being Acalephs, and to this what follows above relates.—J. D. D.

On new species of Birds from the Rio Napo, in the Republic of Ecuador. By PHILIP LUTLEY SLATER, M.A.

ELÆNIA LUTEIVENTRIS.

Supra fusca unicolor, alis caudaque paulo saturatioribus; gutture griseo, abdomine medio et crisso cum tectricibus alarum inferioribus sulphureo-flavis, pectore et lateribus oleagineis; rostro et pedibus nigris.

Long. tota 5·3, alæ 2·8, caudæ 2·3, tarsi 0·6.

A typical *Elænia* of the same form as *E. pagana*, the type of the genus, but of smaller size, and differing in colouring from all members of the group with which I am acquainted.

CREURGOPS*, genus novum, Lanioni et Trichothraupidi affine, sed rostro diverso. Rostrum breve, crassum, culmine versus apicem incurvo, gonyde vix ascendente, commissura modice arcuata, mandibula superiore dente mediali distincto et altero finali instructo; vibrissis rictalibus nonnullis: alæ modicæ, caudæ tertiam partem attingentes, remigibus secunda, quarta et quinta æqualibus et longissimis, prima his paulo brevior: cauda longa, apice quadrata.

CREURGOPS VERTICALIS, J. Verreaux, MS.

Supra fuscescenti-schistacea, pileo semicristato saturate ferrugineo, hujus lateribus cum fronte nigricantibus: alis caudaque fusco-nigris; subtus ferruginescenti-ochracea: rostro nigricante, gonydis basi albida, pedibus fuscis.

Long. tota 6·2, alæ 3·2, caudæ 2·5, rostri a rictu 0·7, tarsi 0·85.

This peculiar Tanager seems to belong to the neighbourhood of *Lanio*, *Tachyphonus* and their allies, and, like the former, has a very sharply defined notch about two-thirds of the distance along the edge of the upper mandible. But the bill is otherwise very different from that of *Lanio*, being much shorter, broader, thicker, and more swollen, with the culmen much arched towards the tip. The single specimen which I have examined is not in very good condition, but its perfect distinctness from every known species of Tanager is obvious at first sight.—*Proc. Zool. Soc.* Jan. 26, 1858.

On the Genera Orbulina and Globigerina of D'Orbigny.

By L. F. POURTALES.

Hitherto the two genera of Foraminifera established under the names of *Orbulina* and *Globigerina* by D'Orbigny had been widely separated in the classification; he had even put them in different orders, although he had remarked the similarity in the structure of the shell. Ehrenberg also places them in different families (the former under the name of *Miliola*), but marks the two genera of *Miliola* and *Gromia* as doubtful, and appends to the characteristics

* κρεουργὸς lanius, et ὠψ facies.

of the family of *Miliolina* the query, "An status juvenilis reliquorum?" M. S. Schultze makes of *Orbulina* a family among his Monothalamia, whilst *Globigerina* is included in a subfamily of the family of *Turbinoida* among the Polythalamia.

I think I am now able to show, by numerous preparations, that these two supposed genera are only different stages in the cyclical or alternate generation of the same species. Having had an opportunity of examining large numbers of well-preserved specimens obtained from the bottom beneath the Gulf Stream by the U.S. Coast Survey, and entrusted to me for examination by Prof. Bache, Superintendent, I have found in nearly one-half of the *Orbulinæ* examined, young *Globigerinæ* more or less developed, and attached to the inside of the *Orbulina* by numerous very slender spicules. Only one *Globigerina* is developed in an *Orbulina*, whose cavity it gradually fills up, and whose shell it finally bursts to make its escape. At that time the *Globigerina* has already nearly attained its full size, and I have counted as many as sixteen cells in a specimen having yet room for several more before filling up the parent *Orbulina*.

How the *Orbulina*-form is reproduced I have not yet traced out. None were noticed of very small size among those examined. Large individuals are frequently found containing a smaller one filling the cavity exactly; the old shell is finally cast off, and appears to remain attached in fragments to the young one for some time. I am unable to say as yet whether this is to be considered as an act of reproduction, or merely as a renewing of the shell. It is not rare to find *Orbulinæ* with this double shell containing already a young *Globigerina*.

I hope to be able to follow out the whole chain of development of these beings; but the above facts have appeared to me interesting enough to be at once communicated.—*Silliman's Journal*, July 1858.

On the Anatomy and Development of the genus Myzostoma, Leuckart.
By C. SEMPER.

The discovery of a new species of *Myzostoma*, living, like the three others already known, parasitically upon *Comatulæ*, has afforded M. Semper opportunity for renewed studies on the affinities of this singular genus. The systematic position of the *Myzostomæ* remains as problematical as before. These parasites remind us, by their suckers, of the Entozoa, Annelida, and Crustacea; their feet are formed like the rudimentary extremities of the setigerous Annelida; their digestive apparatus allies them either to the Entozoa and the Annelida, or to the Arachnida; and their hermaphroditism has its analogue among the Entozoa, Annelida, Arachnida (Tardigrada), and Crustacea. As to their nervous system, it is unlike that of any other animals. The form of very young individuals has some similarity to that of the Tardigrada.—*Zeitschr. für wiss. Zoologie*, ix. p. 48, 1857.

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XXIV.—*On Fecundation in Eudorina elegans and Cryptoglena.*
By H. J. CARTER, Esq., H.C.S. Bombay.

[With a Plate.]

FOR the last four years, just about the end of May and beginning of June, when the water in the tanks becomes very low, and is reduced to two or three pools, or a shower of rain makes such pools in those which are already dry, and when, in both instances, a development of *Euglena* has taken place, I have seized these opportunities, which are but of short duration, as the development soon becomes expended, to study, not only the *Euglena*, but *Eudorina*, *Gonium*, and *Chlamydococcus*, which all make their appearance at the same time, more or less together, and in such numbers as to give a deep-green tint to the water in which they are generated.

This year my attention has been more particularly directed to *Eudorina*; for in one pool I found it undergoing fecundation, which being similar to that described by Dr. F. Cohn in *Volvox globator**, an account of it will serve not only to confirm what that eminent Infusorialist has stated, but also to furnish a fresh instance of this process in another and closely allied organism.

Before, however, going to the fecundation, it is desirable that we should trace the development of *Eudorina* up to this point; but not having been able to recognize this organism in its simplest form, that is, as a solitary single cell, nor any stage of its *segmentation* prior to the third degree of duplicative subdivision (that is, into 16 cells, when the mother-coverings have dropped off), I must begin from this period.

At this time, which we will call the first stage, the *Eudorina*

* Comptes Rendus, t. xliii. p. 1054, Nov, 24, 1856.

consists of an ovoid green body, partially divided into the number of cells just mentioned, each of which is provided with a pair of cilia which project through a thin gelatinous envelope that surrounds the whole mass. It is now in its smallest size, about 5-5400ths of an inch long, that is, not more than the diameter of the *Chlamydococcus-cell*, fig. 9. Pl. VIII., and swims by means of its cilia, with the small end foremost, and with a rotatory motion on its longitudinal axis, as often from right to left as from left to right. An eye-spot is also present in each of the four anterior cells, but seldom visible in the rest at this period.

As the development progresses and the *Eudorina* increases in size, the division becomes complete, and each cell, in addition to the granular mucus and chlorophyll which line its interior, may now be seen to be provided internally with a spherical translucent utricle (which is the nucleus), an eye-spot situated peripherically and midway between the cilia and the opposite end of the cell, a contracting vesicle* at the base of the cilia, and the pair of cilia themselves. Each pair of cilia passes out through a single channel in the gelatinous cell or envelope, which has now become much thickened—and thus their movements are limited up to this point,—while a defined line internally marks the boundary of the original cell-wall, through which, of course, the cilia also pass (Pl. VIII. figs. 1, 2).

During the second stage, each of the cells again undergoes duplicative division (the nuclei having been doubled previously), and the whole organism becoming larger, they are separated from each other, and, being no longer subject to the compression which, with the lines of fissiparation tending towards the centre of the ellipse (see section, fig. 2), and their confined position, induced a more or less conical and polygonal shape, now become spherical and enclosed respectively within distinct transparent capsules (fig. 3). The *Eudorina* is now 30-5400ths of an inch long, and contains thirty-two green cells, which are evidently situated between two large, ovoid, colourless, transparent cells, one of which bounds a similarly-shaped cavity in the centre of the *Eudorina* (fig. 2 c), and the other is the original cell-wall (a), round which again is the newly secreted envelope (b),—while the green cells are further fixed in their respective positions by the passage of their cilia through the two latter, both original cell-wall and envelope (fig. 2 h and fig. 8 c). Thus we see that the *Eudorina* is derived from a simple (daughter-) cell, and that its green cells have resulted from a duplicative subdivision of the green matter which lined the cavity of this

* *Gonium* has two "contracting vesicles," unless, as in *Euglena*, one is a reservoir to the other.

cell*. Arrived at this state, which we shall presently see is that of maturity, we also observe that the posterior part of the envelope becomes crenulated, apparently from flaccidity (fig. 3 g).

After this, however, it again presents another phase, which may be called the third or last stage of development. Here *each cell* again undergoes a rapid duplicative subdivision into sixteen or thirty-two cells, which, in the group, assume a more or less oblong figure respectively; and thus the *Eudorina*'s length is increased to 50-5400ths of an inch. The internal structure now gradually breaks down before the external envelope, when for a short time the groups may be seen swimming about the cavity thus formed, till at last the envelope bursts and they become liberated. What becomes of them afterwards, I cannot state from observation; but the green cells having been greatly reduced in size by the latter subdivisions, it is probable that many of the groups, if they do not form new individuals, sooner or later become disintegrated, and the *Eudorina* thus eventually perishes†.

When, however, the process of impregnation takes place, the division stops at the second stage, that is, when the *Eudorina* consists of thirty-two cells of the largest kind, each of which is about 1-1866th of an inch in diameter within its capsule, which is therefore a little larger. The process is as follows:—

At a certain period after the second stage has become fully developed, the contents of the four anterior cells respectively present lines of duplicative subdivision which radiate from a point in the posterior part of the cell (and this distinguishes this subdivision from that (fig. 1) which took place in the original cell from which the *Eudorina* was derived, and that which takes place in the third or last stage of development just described, where the lines of fission tend towards the centre of the ellipse or ovoid cell). These lines, which ultimately divide the green contents of the cell into sixty-four portions, where the division stops, necessarily entail (from their radiating from a point and terminating a little beyond the centre of the cell) a pyriform shape on the segments, from whose extremities a mass of cilia may be observed waving in the anterior part of the cell of the parent, while yet her own pair of cilia are in active motion, and her eye-spot still exists *in situ* on one side of her progeny,—thus showing that the latter may be almost fully

* It is assumed that the green contents get their cell-wall through in a plastic state, before the segmentation commences, as will be seen hereafter.

† For good illustrations of this stage, see Prof. Henfrey's description and plate of *Pandorina Morum*, Quart. Journ. Microscop. Soc. vol. iv. p. 49, 1856.

formed before the parent perishes (fig. 4 *a*). At length, however, this takes place, and the progeny, which we shall henceforth call 'spermatozoids,' separate from each other, and finding an exit, probably by rupture, through the effete parent-cell and her capsule, soon become dispersed throughout the space between the two large ovoid cells mentioned, where they thus freely come into contact with the capsules of the twenty-eight remaining or female cells (Pl. VIII. fig. 5).

The form of the spermatozoid now varies at every instant, from the activity of its movements and the almost semifluid state of its plasma; and therefore, if we had not seen it in the parent-cell (fig. 6), it would be very difficult to define what this form really is. Its changes in shape, however, are confined to elongation and contraction, like those of *Euglena viridis* (fig. 7), and not polymorphic, like those of *Amœba*; hence it is sometimes linear-fusiform or lunular, at others pyriform, short, or elongate. The centre of the body is tinged green by the presence of a little chlorophyll, while the extremities are colourless (fig. 7); the anterior one bears a pair of cilia, and there is an eye-spot a little in front of the middle of the body, also probably a nucleus. Thus we have a product widely different from the common cell of *Eudorina*. It is about 1-2700th of an inch long, and 1-10,800th of an inch broad.

Once in the space mentioned, the spermatozoids soon find their way among the female cells, to the capsules of which they apply themselves most vigorously and pertinaciously, flattening, elongating, and changing themselves into various forms as they glide over their surfaces, until they find a point of ingress, when they appear to slip in, and, coming in contact with the female cell, to sink into her substance as by amalgamation (fig. 5 *c, c*). I say "appear," because, the female cells as well as the spermatozoids being so small, so numerous, and so nearly grouped together, and there being no point like a micropyle that I could discover, and the *Eudorina* continually undergoing more or less rotation, I do not feel so certain of having seen the act of union take place as if there had been only a female cell present with a fixed point for the entrance of the spermatozoids, as in the resting-spore of *Œdogonium*. But the act itself does not require to be seen; for the constancy of this form of *Eudorina*, the way in which these little bodies are produced, their plastic nature, and their behaviour towards the female cells are quite sufficient to convince those who have given their attention practically to such subjects that they are spermatozoids, and that there can be no other object in their congregating about the female cells than impregnation. If this be not sufficient, their number may frequently be seen to diminish as they pass backward among the female cells,

when their disappearance can only be accounted for by their having become incorporated with the green cells. *Eudorina* in this stage also may frequently be seen with all the four anterior cells absent, and only a few spermatozooids left, most of which are motionless and adherent to the capsules,—indicating that the rest have disappeared in the way mentioned. Lastly, many *Eudorinae* in this stage may be observed with not only the four anterior cells absent, but with hardly a single spermatozoid left,—indicating that the whole had passed into the female cells, or had become expended in the process of impregnation. I have never seen any spermatozooids in the central or axial cavity (fig. 2 c), nor do I think that there is a means of their escaping externally without rupture; so that their being confined to the space between the two ovoid cells of the *Eudorina*, where the green cells are situated, is another reason, if any more be needed, for considering them fecundating agents.

What changes take place in the *Eudorina* after this, I have not been able to discover. At the time, the female cells appear to become more opake by the incorporation of the spermatozooids, and the crenulated state of the posterior part of the envelope in this stage seems also to indicate an approach to disintegration. I have also observed that those *Eudorinae* which are undergoing, or apparently have undergone impregnation, are less active than the rest,—that is, those in which the spermatozooids are scattered throughout the interspace mentioned and applying themselves to the capsules of the green cells, and those in which there are only a few spermatozooids left. But even if they did become disintegrated, the latter, when free, would so closely resemble those of *Chlamydococcus* (fig. 9), which was also abundantly present, that unless the *Eudorina* could be found undergoing impregnation by itself, or apart from this organism, there appears to me no chance of distinguishing the two, and therefore no other means of completing this part of its history. It is true that the impregnated cells may undergo some change in form similar to those of *Volvox globator* after impregnation*; but I think I should have seen this among the numbers which came under my observation, if it had been the case.

While undergoing impregnation, the female cells always contain from two to four nuclei, as if preparatory to the third stage of development (Pl. VIII. figs. 3 h and 4 b), into which they are sometimes actually seen passing, with the spermatozooids present and scattered among them; but the effect of impregnation generally seems to arrest this stage, and thus save the species from

* See Ehrenberg, tab. 4. figs. 2 & 3; also Busk, Quart. Journ. Microscop. Soc. vol. i. p. 38 and pl.; and Cohn, l. c.

that minute division which leads to the destructive termination of *Eudorina* already noticed.

Sometimes all the cells together undergo the spermatoid fissuration, when the *Eudorina* passes into *Pandorina Morum*, Ehr.; but in this case the development does not stop at the pyriform spermatozoids, but goes on to the development of thirty-two larger globular cells in each group, similar to those produced in the third stage of *Eudorina* above described, when they assume respectively a dome-shaped form, held together by a membrane which is fixed to the point in the posterior extremity of the cell from which the lines of fissiparation first radiated (fig. 8). As the groups, however, progress in development, this dome appears to become flatter, and, the *Eudorina* breaking up, as in the third stage, these groups, when liberated, finally appear to pass into the form of *Gonium*, when I think they perish, like the corresponding groups of the third stage. I did not observe this development (in which may be included some abnormal states, where one or two of the spermatoid cells fail, and one or more of the female cells take on this mode of fissiparation irregularly) until the normal one of impregnation ceased to appear. Ehrenberg was wrong in giving the cells of *Pandorina* and *Eudorina* single cilia, as has before been stated; and partly wrong in leaving out the eye-spot; both of which, though disappearing ultimately, indicate the continued life of the parent-cell, as in the development of the spermatozoids, long after the formation of her progeny.

Thus the process of impregnation in *Eudorina* agrees closely with that described by Dr. F. Cohn in *Volvox globator*, in which organism I had seen some of the cells of the interior undergoing a spermatoid development exactly like that above described, and also that previously figured by Mr. Busk*, and alluded to by him as one of "microgonidia†;" and therefore the moment I perceived it in *Eudorina*, in connexion with Dr. Cohn's announcement, I felt convinced that the latter was right, and that I had before me *Eudorina* also undergoing a similar process of fecundation.

So much for the spermatoid development; let us now return to that of the *Eudorina* in totality, concerning which there is still an interesting question for our consideration, bearing on the early development of this organism, which I have already stated my inability to supply, viz. how does the sixteen-division of the cell in the third stage of development take place, so as to allow the cilia to become external? It will be remembered that this cell in the second stage, before it passes into the sixteen-division of the third stage, consists of its capsule or cell-wall and the

* *Loc. cit.* pl. 5. fig. 14. † *Id.* p. 45.

green contents; and it should also be remembered that, although these contents have now no other covering distinct from the protoplasm but the capsule, yet in all algal cells, whenever the green contents take on a new form, such as that of a spore or group of cells, a second more delicate covering is separated from them, for which I have heretofore used the term "protoplasmic sac*"; these two coverings, then, are the parental division of the mass, and become caducous as the rest takes on its new form and develops on *its* surface a cell-wall. Thus we get the sixteen cells separated from their capsule, &c., and surrounded by their proper cell-wall and the external envelope, which may be a still further thickening of the former, or a new secretion; but, be this as it may, the cilia are seen outside it. And at first it might be thought that they were formed before either the cell-wall or envelope, so as never to have been enclosed by either; but if this were the case, the cilia of the sixteen cells, which are added by duplicative division to the first stage of *Eudorina* to form the second stage, should be inside these coverings, or protrude through the original sixteen channels with the other sixteen pairs of cilia. However, neither is the case; for these sixteen cells have their channels respectively as well as the other sixteen cells, in which case they must have been made by the sixteen new cells themselves, unless the thirty-two division is formed before the pellicle, which subsequently forms the cell-wall, is supplied; and our first stage does not pass into the second stage, but both forms are produced at once and separately from the beginning,—a point which can only be determined by following the development of the *Eudorina* from the spore itself, and that, too, alone, since it is impossible to say whether the sixteen-division groups, when previously mixed up with all the other forms of *Eudorina*, are or are not derived direct from the spore, or from the third stage of development of this organism. That the sixteen-division or second stage may pass direct into a similar form to the third, that is, into a form of *Eudorina* consisting of sixteen groups of sixteen cells each, I have occasionally seen; but then this form has been globular (only 30-5400ths of an inch in diameter), and not ovoid, although the groups have possessed the latter form: perhaps this is the spore, and the sixteen groups the young *Eudorinae*, if not a different species. Again, the robust individuals of the sixteen-division one would think to be direct from the spore, and to pass into the robust individuals of the second stage or thirty-two division,—while the puny, meagre individuals one would think to come from the third stage, and, as before conjectured, end in disintegration and death. But all this, as I have just stated,

* *Annals*, vol. i. 1858, p. 31, &c.

can only be determined by following the development of the spore from the commencement. One fact I might add, however, viz. that the robust forms about the size given in fig. 1 have the power of withdrawing their cilia and protruding them again; this happens when they are transferred, from the vessel in which they may be contained, to the slide for examination: many may just at this time be seen to be motionless, with the channels for the cilia empty; but gradually the cilia are protruded through them, and as gradually the *Eudorina* evinces increasing power of motion, until they are fully protruded, and it swims away.

Chlamydococcus undergoes the same kind of changes in development as *Eudorina*, from which it only differs in structure in being smaller, and globular instead of ovoid, in the absence of an external envelope, and in the cilia of the daughter-cells being *included* within the parent-cell; hence it also differs in being motionless, though the compartments of the daughter-cells are sufficiently large for them to turn round and move their cilia freely therein, which they are continually doing (figs. 9, 15). The primary cell of *Chlamydococcus*, like that of *Eudorina*, divides up into two, four, eight, or sixteen cells, and those of the eight- and sixteen-divisions again into groups of sixteen or thirty-two each (fig. 14), so as to resemble the third stage of *Eudorina*. Hence we may perhaps infer that its fecundating process is similar to that of *Eudorina*; but this remains to be discovered. *Chlamydococcus* has also a great tendency to stop at the two- and four-division, from which it may pass into the "still" or *Protococcus*-form, and, floating on the water in a kind of crust, present cells of all kinds of sizes undergoing "still" division. In all its multiplications, partial and entire, however, it generally maintains its primary or spherical form, and does not become ovoid or oblong, like the groups of *Eudorina*, the only exceptions being in the two- and four-division, where the green cells are sometimes ovate (probably from want of room in the parent capsule, fig. 11), as represented by Ehrenberg in *C. Pulvisculus**,—to which I should refer it, had he not also given an ovate form to the type-cell of this species†; nor can I refer it to *C. pluvialis*, for in all the changes I have yet seen it undergo, the red colour has not increased beyond the minute eyespot, while this also disappears, and the cilia too, when this species passes into the "still" form (fig. 15). Here it undergoes the same kind of division that it does in the active state; but the parent-cell, instead of becoming distended by imbibition, remains closely attached to the daughter-cells, so as to give the group a

* Tab. 3. fig. 10.

† There is an ovate species, common in Bombay; but this has four cilia.

mulberry shape (figs. 16, 17). How long it remains in the "still" form I am ignorant; but having only seen it in the active state during the months of May, June and August, and throughout the rest of the year in the "still" one, I am inclined to think that it only comes into the active state during the summer months, and then for the purpose of fecundation.

Does not the disappearance of the eye-spot in the "still" form thus seem to point out its analogy with the bright colours, especially the red, presented by plants in their flowers during the season of fecundation, rather than with the eye of animals?

In several instances, also, where I have found this *Chlamydococcus* with *Eudorina*, they have been accompanied by long Closteriform cells. It was the case in that above mentioned, where the latter was undergoing impregnation. Some of these have an eye-spot, which, with the nature, arrangement, and general aspect of their internal contents, show that they belong to the class of organisms with which they are associated. Their cell-wall also is more or less plastic, or was so when they were assuming this spicular form; for many have one or more *diverticula* extending from them, some are bifid, and a few irregularly stellate. What they are, I know not; but Dr. Cohn has figured the same kind of cells, in company with *Sphaeroplea annulina*, under impregnation*.

Trachelomonas, Ehr., also appears to me to undergo multiplication in a similar way to *Eudorina* and *Chlamydococcus*; for I have often seen the largest Trachelomonad of a pool divided up into a group of apparently sixteen cells within the lorica; and this may account for the myriads of three to four smaller sizes that are frequently found together in this way. The latter certainly appear in a green form first, that is, without the lorica, which gradually becomes supplied afterwards. Thus, impregnation also in the Trachelomonads may take place like that already mentioned in *Eudorina*, after the parent-cell has undergone division within the lorica. At first I thought that the first form of *Eudorina* arose in this way, and that when the division of the Trachelomonad arrived at sixteen, the lorica burst, and thus liberated a *Eudorina*; also that the cells into which the *Eudorina* ultimately divides formed the small Trachelomonads; but in the pools where I found the *Eudorina* undergoing impregnation there was not a single Trachelomonad, so that this theory does not hold good.

How *Euglena viridis* and the *Euglenæ* generally become impregnated, I have no conception. There is no doubt that *E. viridis* becomes distended with the cells which I have heretofore

* Ann. des Sc. Nat. t. v. pl. 12. fig. 3. Bot. 1856.

described, and thought to be ovules or embryonic cells*, and that during this time the chlorophyll passes into red grains and subsequently disappears, while the organism is secreting a capsule round itself, and its original cell-wall passes into a tough spherical ovisac, so to speak. But what becomes of this if it be the result of impregnation, or what the process of impregnation is like, or when it takes place, is for future discovery to determine. *E. viridis* does not become capsuled in this way, and is found floating on the water aggregated into layers one cell deep, or buried singly in the mud of tanks, after the capsulation has thus taken place.

It now only remains for me to state that my observations on *Eudorina* this year have been chiefly confined to two pools within two hundred yards of each other, one of which, viz. No. 1, is in a clean quarried excavation in the trap-rock, and the other, viz. No. 2, in an excavation in the soil. In both, which were previously dry, the rain fell on the 31st of May, so as to form small pools of water about two feet deep; and in both, on the 3rd of June, the water was tinged green with *Eudorina*, &c.

In No. 1, *Eudorina elegans*, *Chlamydococcus*, *Euglena viridis*, and an elliptical unicellular Alga abounded, to the exclusion of almost every other organism of the kind. The *Eudorina* was undergoing the process of fecundation, and the *Chlamydococcus* the transformations above described, respectively. On the 8th, the specimens of *Eudorina* under fecundation began to get scarce; and on the 13th the *Pandorina*-form made its appearance. By the 14th all organisms of the kind except the *Eudorina* and *Chlamydococcus* had disappeared, and the *Pandorina*-form was also rarely seen. The *Chlamydococcus* then began to float on the surface in the *Protococcus*-form above mentioned, and at length this sunk to the bottom, when, by the 19th of June, the remains of *Eudorina* and *Chlamydococcus* were but sparsely scattered through the water, which had now lost its green tint; indeed, it was evident that the development of all the green organisms had become exhausted. Up to this time there had been only a few more drops of rain; but the next morning the storms of the monsoon commenced.

In No. 2, *Eudorina elegans*, *Euglena viridis*, and *Trachelomonas* abounded, to the exclusion almost of every other organism of the kind; thus it contained no *Chlamydococcus*, while No. 1 contained no *Trachelomonas*. Corresponding changes took place in the *Eudorina* to those above described, with the exception of the impregnatory one.

Out of a dozen instances in which I have watched the deve-

* Annals, vol. xx, p. 36. pl. 1. fig. 16, 1857.

lopment of *Eudorina* during the past four years, I have thus only once met with it under fecundation.

As regards the effect of iodine (both by itself and assisted by sulphuric acid) upon *Eudorina*, I could never obtain a blue colour in the cells at any time; but it was distinctly visible in the transparent structures between them, perhaps in their capsules and the cellulose material which supported the rest of the organism. The contents of the cells always assumed a brown colour. The same was the case with the *Chlamydococcus*, though I see by my sketches that the solitary dividing still-cell, in the autumn of 1855, became blue throughout under the action of iodine and sulphuric acid.

Since the above was written, I have had the good fortune to meet with a *Cryptoglena* undergoing fecundation, of which the following is a description, both of the organism and the process:—

Cryptoglena lenticularis, nov. sp. Pl. VIII. figs. 18, 19.

Lorica lenticular, compressed, emarginate, uniformly and minutely granulated, transparent, colourless by transmitted, brownish by reflected light; margin of a deeper colour than the rest, probably from the proximity of the sides; presenting on the edge a notch anteriorly, one lip of which projects beyond and slightly overlaps the other, from which it is separated by an oblique fissure. Internal cell lenticular, compressed, one-fourth less in diameter than the lorica, lined with green chlorophyll and granular protoplasm, provided with a pair of cilia which pass out at the notch in the margin of the lorica, a single contracting vesicle at their base, a red eye-spot median and peripheral, and a nucleus. Lorica splitting into halves during fission. Long diameter 1-1350th of an inch.

Found in most of the tanks and many of the wells in the island of Bombay. Active throughout the year.

Obs. This is the little *Thecamonadina* to which I have before alluded, as being associated with a species of *Edogonium*, and which I wrongly conjectured to be a spore of this Alga*. It resembles *Cryptomonas lenticularis*, Ehr., in the compressed form and thickness of the lorica, while the bilabiate notch and oblique fissure in the margin ally it to *Euglena*, but not to *Trachelomonas* or *Lagenella*, which have a round aperture respectively for the exertion of their cilium. It approaches *Chlamydococcus* in having two cilia, and in its mode of fission, whilst it resembles *Schizochlamys*, Braun, in the splitting of the lorica.

* *Annals*, vol. i. 1858, p. 35.

Perhaps Ehrenberg's *Cryptomonas lenticularis*, being without eye-spot or cilia, is a "still" form of it; but it approaches nearest of all to his genus *Cryptoglana*.

I found this little Alga (for such in the end it must be considered) on the 2nd of July, in company with another heart-shaped *Cryptoglana*, which will be described presently, in great numbers in a little portion of shallow water connected by the rain with a pit into which the drainings of a buffalo-shed were received. With them were also *Euglena Acus*, *Eudorina elegans* (undergoing the process of fecundation above described), *Uvella Bodo*, Ehr., and here and there *Euglena viridis*; but the bulk of the organisms present consisted of the two first-mentioned; the rest, with the exception of *Euglena Acus*, were only now and then seen.

While examining some of this water, I was struck with the number of deciduous loricae present, some of which were split into halves which were separated, while others only adhered together anteriorly, and presented a pair of cilia attached to their point of union (figs. 25-27); and on looking round for their origin, it was soon found that they belonged to the *Cryptoglana* above described, for the internal cell of that organism was in several instances seen escaping from them, not only singly, but after having undergone duplicative subdivision into two, four, eight, sixteen, thirty-two, or sixty-four gonidia (figs. 20-24). Moreover, it was observed that each of these groups came forth in a delicate cell (the protoplasmic sac*), which, by imbibition of water, became distended, in some instances, to two or three times the diameter of the lorica, and, thus assuming a globular form in the four-, eight- and sixteen-divisions, were undistinguishable from *Chlamydococcus* under similar forms (figs. 22, 23),—a point which still more nearly allies these organisms.

Still seeking for more of these varieties, it was observed that the first division, viz. that in which the internal cell came forth with only two gonidia, was invariably surrounded by a swarm of from ten to twenty much smaller gonidia (figs. 26, 27), which, on turning to the sixty-four division, were found to be identical, to all appearance, with the gonidia of this degree, of which there were numerous instances present, not only where the lorica was as yet unruptured, but where the internal cell had been liberated and the group were swarming within it, and where this cell had also become ruptured, and the gonidia were issuing one after another through the opening (fig. 25).

Now, the only organism present which was undergoing this subdivision being this *Cryptoglana*, and this, therefore, being the only

* See "Fecundation of *Cedogonium*," Annals, 3 ser. vol. i. p. 31, note.

one which could furnish the double spore-cell and smaller gonidia in large numbers, while in most instances the split lorica still adhered to the internal cell as a mark of identification, no doubt could be entertained that both the large and the small gonidia belonged to the same organism, that their coming together under such circumstances could only be for the purpose of fecundation, and that they therefore were the female cells and spermatozooids of this species.

I therefore watched the motions of the spermatozooids so situated, in two or three instances for more than half an hour together, during which time they dashed themselves against the cell, adhered to it, retreated from and advanced upon it, with unabated rapidity, but without penetrating it,—when, having little time left, comparatively, for such observations, I sought out group after group quickly, without watching it long at a time, until I had the good fortune to find one in which, after a moment's watching, one of the spermatozooids appeared within the cell, and, fixing itself to one of the spores or female cells, gradually became incorporated with it (fig. 26). This was sufficient to convince me of the fact I had anticipated; but it would have been more satisfactory to have seen it repeated, and probably I might have done so had the fecundating process in the colony been prolonged; but it only lasted three days after I first discovered it, and during that time I had little leisure to devote to the subject; for to be successful in researches of this kind requires uninterrupted observation for long periods together. However, had I not even seen the incorporation, no other interpretation could be given to the facts mentioned than that they were connected with the process of fecundation.

I have stated that the cell containing the two gonidia was the one invariably surrounded by the spermatozooids; but it was not the only one, for in two or three instances a few were found around and adhering to the inner cell of the four-division (fig. 21) after liberation, indicating that the gonidia of this division were also sought after by the spermatozooids, if even in the end they did not become reproductive. It was also observed that the two-division did not always come forth in one cell, but that sometimes this was also divided, so that each gonidium had its proper cell (fig. 27).

The form of the macrogonidia or female cells did not differ from the internal cell of the parent, except in being a little smaller,—while the microgonidium, which was not more than 1-7th of the diameter of the macrogonidium, and therefore very small, appeared, though equally green and provided with an eye-spot, to have only one cilium. I cannot help thinking, however, that, with a higher power, I might have seen two.

What changes took place in, and what became of, the macrogonidia after impregnation, I am unable to say; but it will be remembered that the only other organism present in equal number with the *Cryptoglena* above described, and to the exclusion almost of all other organisms, was one with a heart-shaped lorica. In this, however, no fissiparative changes like those above mentioned took place; but on the third day after the water containing them and the other *Cryptoglena* had been placed in basins, all other organisms disappeared but this, which had taken on the form of a resting-spore; that is to say, the cilia had shrunk up or had dropped off, the internal cell had become encapsuled within a thick cell externally and a thin one internally, within which, again, the chlorophyll had passed from a green into a light brick-red colour, and the granular protoplasm into a number of larger granules presenting a more or less uniform size and oleaginous refractive aspect (fig. 29). Whether these were the impregnated spores of *Cryptoglena lenticularis* or not, I have now no means of determining; for instead of collecting a few of them immediately and drying them for future experiment, this was deferred for a day or two, during which time some other organism (probably *Coleps*, the usual aggressor under these circumstances) ate them all up. All therefore that remains favourable to the inference is, that this spore, in its active state, was almost exclusively associated with *C. lenticularis*, and in equal number, and that it did not undergo fissiparation like this, but, on the contrary, passed into the form of a resting-spore. Against this, again, is the form of the lorica, and its having four cilia instead of two; hence, in case it should be a different species, it is desirable to give it a name and description, which may stand as follows:—

Cryptoglena cordiformis, nov. sp. Pl. VIII. fig. 28.

Lorica heart-shaped, round, transparent, emarginate anteriorly, round posteriorly. Internal cell globular, lined with chlorophyll and granular protoplasm, provided with four cilia, which issue through the notch in the lorica, an eye-spot median and peripheral, and one to three nuclei or utricles of a circular form. Swimming with its cilia forwards, and a rotating motion on its longitudinal axis. Length of lorica 1-933rd of an inch; diameter of internal cell 1-1350th of an inch.

Found only in one instance, in company with *Cryptoglena lenticularis*, when undergoing the process of fecundation above described.

Having thus established another mode of fecundation in an organism closely allied to the simplest of all vegetable forms,

viz. the unicellular Algae, it becomes interesting to inquire how far the same process is likely to occur in the other families to which it is allied. I have stated above, that, from *Chlamydococcus* undergoing a similar duplicative subdivision to *Eudorina*, it is not improbable that it undergoes a similar mode of impregnation also; but in the fissiparation of *Cryptoglena lenticularis* we find such a resemblance to the compound groups of *Chlamydococcus*, that it now seems more likely that it should resemble that of *Cryptoglena lenticularis*. Again, I have stated that *Trachelomonas*, which is also a *Thecamonadina*, presents an appearance of fissiparation in its internal cell, which might enable it to undergo a fecundating process like *Eudorina*; but *Trachelomonas*, being loricated, is closely allied to *Cryptoglena lenticularis*, and therefore might rather be expected to undergo a fecundating process like the latter. The notch and oblique fissure also ally *Cryptoglena lenticularis* to the *Euglenæ*: but then the spiral-fibre coat of this family could not give way for the elimination of an internal cell with gonidia, like the lorica of the former; hence this fecundating process seems to throw no light on that of *Euglena*, which has yet to be discovered, and no doubt will be, sooner or later. But it is necessary to find out the time of the year when these processes are likely to take place, and where the organisms which are likely to be undergoing them make their appearance annually,—after which the water should be examined daily, immediately after the rain-falls; otherwise those which are required will be very likely to appear and go through the fecundating process (just as fast as some plants flower and seed) before their presence is even noticed. Hence, a place where there is rain occurring regularly only once a year is best fitted for these researches; and I feel convinced that, had I had better health and more leisure at the beginning of this “rains,” I should have been able to have done much more in this subject than is above communicated.

August 7th.

P.S.—I have to-day seen the incorporation of the spermatozoid with the macrogonidium of *Cryptoglena lenticularis* take place several times, and once so satisfactorily that I am able to assert the fact without reservation. The former, after having fixed itself upon the latter, assumes a conical or peg-top shape, and thus gradually appears to squeeze itself into the macrogonidium. I have also ascertained that this spermatozoid has two cilia, as I had before supposed.

I would also notice here, that, in rating my micrometer, I have just found out that the 5600th and 1900th divisions should be 5400th and 1880th of an inch respectively. The reader is

therefore requested to make this correction in all my previous measurements where these divisions are mentioned, and to allow for this generally, indeed, in all my measurements.

[The necessary alterations have been made in the present paper.—Ed.]

EXPLANATION OF PLATE VIII.

N.B. All the figures in this Plate have been delineated as nearly after nature as the circumstances of the case would allow; and in order that their relative size may be seen, all, with the exception of figs. 6, 7 and 8, have been drawn on a scale of 1-12th to 1-5400th of an inch.

Fig. 1. *Eudorina elegans*, in its first stage of development, 9-5400ths of an inch long, composed of sixteen cells, surrounded by a gelatinous envelope, through which their cilia project: *a*, four anterior cells in which the eye-spot is visible; *b*, gelatinous envelope.

Fig. 2. Section of ditto, showing—*a*, gelatinous envelope; *b*, original cell-wall; *c*, internal cell enclosing axial cavity; *d*, interspace between original and internal cell-walls, in which the green cells are situated; *e*, nucleus; *f*, eye-spot; *g*, cilia; *h*, canals through gelatinous envelope for the passage of the cilia.

Fig. 3. *Eudorina elegans* in second stage of development, 30-5400ths of an inch long; composed of thirty-two green cells, each of which is 3-5400ths of an inch in diameter, exclusive of the capsule in which it is enclosed: *a*, *a*, *a*, *a*, spermatic cells, now undistinguishable from *b*, *b*, *b*, the female cells; *c*, shaded cell; *d*, nucleus; *e*, eye-spot; *f*, contracting vesicle; *g*, crenulated form of posterior extremity; *h*, nuclei in plurality.

In this, as well as in many other of these figures, the principal part of the cells and detail connected with them, as well as the shading, has been omitted, to save trouble, one or two complete ones being sufficient to show what the rest would be if all were properly filled in.

Fig. 4. Ditto, ditto, ditto, with the contents of the four anterior or spermatic cells transformed into tufts of spermatozooids respectively, —the presence of the eye-spot and movements of the cilia of the parent-cell indicating that she is still alive, though the cilia of her progeny are already waving in her interior: *c*, *c*, shaded female cells.

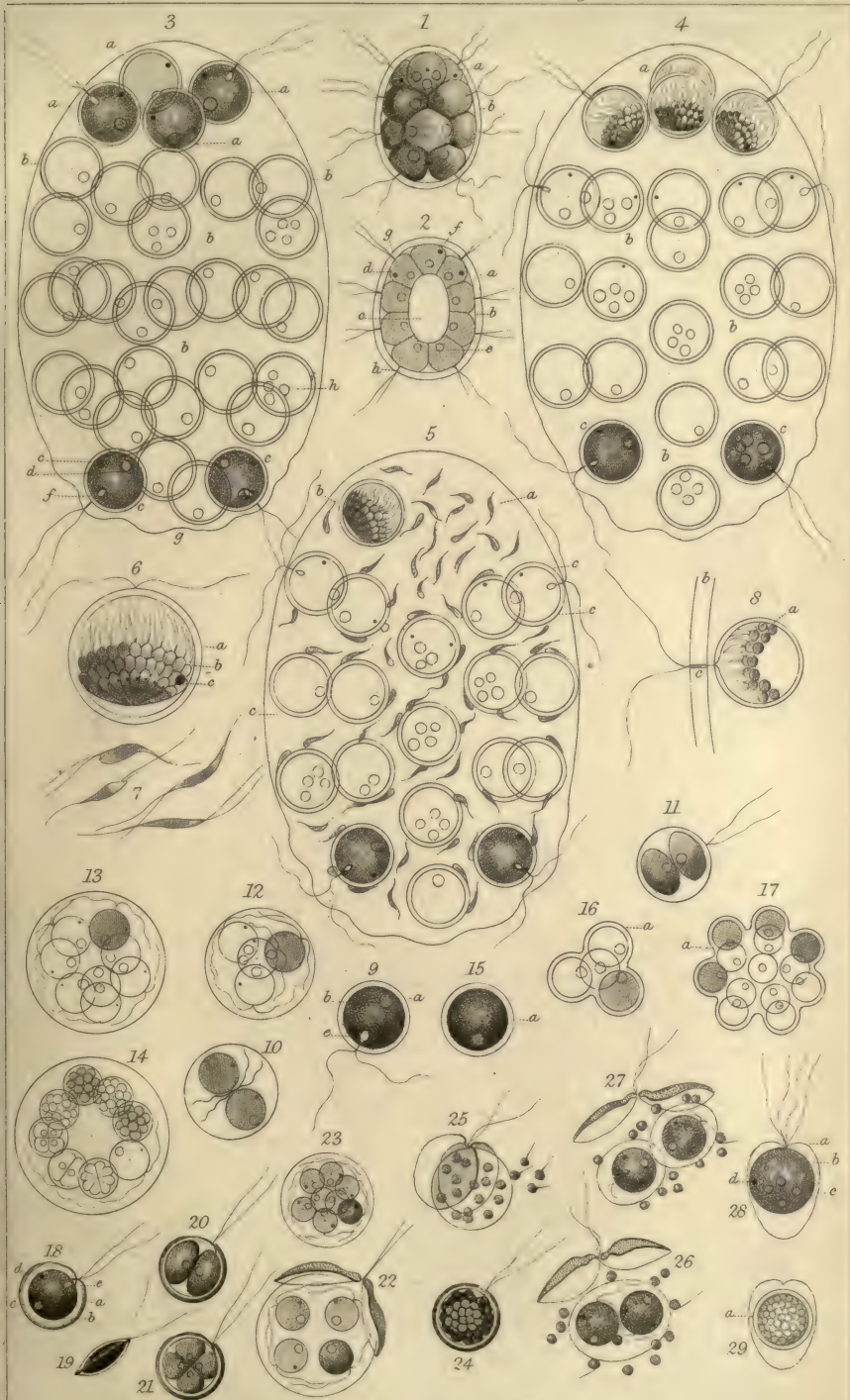
Fig. 5. Ditto, with three of the spermatic cells burst, and their spermatozooids scattered throughout the interspace between the outer and inner cell-walls, where they are vigorously applying themselves to the capsules of the green cells: *a*, spermatozooids apparently within the capsule; *b*, unruptured spermatic cell.

In this and in the foregoing figure, several of the green-cells are omitted, to avoid confusion.

Fig. 6. Single spermatic cell with tuft of spermatozooids more magnified, showing—*a*, capsule; *b*, mother-cell; *c*, eye-spot.

Fig. 7. Spermatozooids more magnified, to show the power they have of elongating themselves.

Fig. 8. A single cell of *Eudorina* in the second stage of development, but under the *Pandorina*-form, that is, where the contents of *all* the cells have undergone the spermatic mode of duplicative subdivision, but stop at sixteen or thirty-two, and pass into small cells of the ordinary form arranged in a tabular manner, like *Gonium*;





a, cells; *b*, gelatinous envelope; *c*, canal through the latter for the passage of the cilia.

The third stage, in which *Eudorina* is 50-5400ths of an inch long, has not been represented, as the reader can supply this for himself by increasing the second stage to the length mentioned, and substituting for each of the cells in this stage a group like that of fig. 1, but a little smaller; the cells smaller, and the shape of the group more or less oblong.

Fig. 9. Chlamydococcus —? in the "active" state; largest size 5-5400ths of an inch in diameter: *a*, nucleus; *b*, eye-spot; *c*, contracting vesicle.

Fig. 10. Ditto, in the two-division. 11. The same with the cells ovate and the cilia of the mother-cell remaining. This resembles Ehrenberg's figure of *Ch. Pulvisculus*.

Figs. 12, 13. Ditto, in four- and eight-division respectively.

Fig. 14. Ditto, in eight-division, with the cells undergoing further division successively up to the sixteen-division.

Fig. 15. Ditto, "still" form, largest size 5-5400ths of an inch in diameter, without eye-spot or cilia: *a*, cell-wall.

Figs. 16, 17. Ditto, ditto, in four- and sixteen-division respectively. Observe that the mother-cell here is not distended into a spherical shape, as in the active form, but contracted round the cells, so as to give the whole a mulberry character: *a, a*, mother-cell-wall.

All the varieties of division which take place in the "active" also take place in the "still" form, and *vice versa*.

Fig. 18. Cryptoglena lenticularis, nov. sp., vertical view, 4-5400ths of an inch in diameter: *a*, lorica; *b*, internal cell; *c*, nucleus; *d*, eye-spot; *e*, contracting vesicle.

Fig. 19. Ditto, horizontal view.

Figs. 20, 21. Ditto, in two- and four-division within the lorica.

Fig. 22. Ditto, in four-division, with the split lorica still adhering to the internal cell, which is 8-5400ths of an inch in diameter.

Fig. 23. Ditto, in eight-division; internal cell 6-5400ths of an inch in diameter.

Both these figures are undistinguishable from the corresponding forms of *Chlamydococcus* in the "active" state.

Fig. 24. Ditto, in the sixty-two- or spermatid division, 4-5400ths of an inch in diameter.

Fig. 25. Ditto, with the lorica effete, and adhering to the internal cell, which contains a number of active spermatozooids, some of which are issuing from a ruptured opening in the cell-wall.

Fig. 26. Ditto, ditto, with the inner cell containing two macrogonidia or female cells, and surrounded by active spermatozooids, one of which has passed into it and is adhering to one of the macrogonidia. Macrogonidium about 3-5400ths of an inch, and microgonidium or spermatozoid about half 1-5400th of an inch in diameter.

Fig. 27. Ditto, ditto, ditto, with the internal cell divided into two, and thus affording a separate cell for each gonidium.

Fig. 28. Cryptoglena cordiformis, nov. sp., in the "active" state. Supposed impregnated spore of *C. lenticularis*.

Fig. 29. Ditto, after transformation into a resting-spore.

XXV.—On the Parasitism of *Osyris alba*.

By Dr. J. E. PLANCHON*.

IN 1847, an English botanist, Mr. Mitten, detected that the roots of *Thesium* adhere by means of suckers to the roots of various plants. A fact like this was very surprising in plants with green leaves; for M. Decaisne had not then made known the similar parasitism of the Rhinanthaceæ. The species of *Thesium* belonging, as is well known, to the family Santalaceæ, analogy would lead to the supposition of a similarly parasitic life in *Osyris alba*, which represents in the south of Europe the most highly developed type of this order. Urged by M. Decaisne, Dr. Planchon sought to verify this presumption; but, for two years, his attempts were vain. The fragile roots of *Osyris alba* leave attached to the nourishing roots the organs of suction which alone could reveal their parasitic character. This year, more fortunate, he has been able to make numerous observations on this subject, the most striking results of which he communicates to the Academy.

Osyris alba lives parasitically upon numerous herbaceous or woody plants (all perennial) belonging to different families of the class Dicotyledons. It implants its suckers upon the roots or the rhizomes which it meets with, not sparing even its own species. *Ailanthus*, *Rhus Coriaria*, *Ulmus campestris*, *Jasminum fruticans*, *Pinus halepensis*, *Rosa canina*, *Silene italica*, *Lychnis dioica*, *Rubia peregrina*, all the inhabitants of hedges or copses, are subject to its attacks.

The roots of *Osyris* arise scattered upon the long rhizomes which creep in the soil at a small depth. They consist of slightly branched fibres, the diameter of which does not exceed 2 millimetres. Their organs of suction are a kind of hemispherical or conical cup, the dimensions of which vary from the size of a pin's head to that of an acorn cup. The same radical fibre may furnish one, two, three, or a whole series of cups. These embrace closely with their circumference the nourishing root. They implant themselves there, moreover, by means of a fleshy process or papilla, of cylindrical or discoid form, which penetrates the foreign root, sometimes stopping short in the thickness of the cortical parenchyma, sometimes insinuating itself between the bark and the wood, sometimes, but more rarely, penetrating as far as the ligneous tissue.

The papilla of suction is formed in all cases by a cellular tissue, which is separated into two zones by a sheath of moniliform pitted vessels. The interior is a medullary zone, the exterior the cortical parenchyma. The contact of the papilla with

* Translated from the Comptes Rendus, July 26, 1858.

the tissue of the nourishing root is established by a simple layer of cells forming the inferior surface of the papilla.

Osyris presents, both in its adult rhizomes and its stems, a pith, medullary rays, and bundles of liber-fibres, which are absent from the roots. There is not, however, that difference between the rhizomes and the stems which M. Chatin supposed he found, doubtless because he examined only rhizomes of the year at the commencement of their evolution. The author could find no true tracheæ in these organs. All the wood-cells, as well as those of the medullary parenchyma, are riddled with pits.

The intimate affinity connecting all the Santalaceæ would lead to the supposition that most, if not all, the types of this group, are parasites. The same may be said of the true Olacineæ (*Olax*, *Ximenia*, *Heisteria*, *Liriosma*, *Opilia*, &c.), which scarcely differ from the Santalaceæ. The black colour assumed by most of these plants on drying, and their absence from gardens, plead in favour of this idea.

Dr. Planchon regrets that he has hitherto been unable to trace the phænomena of germination either in *Osyris* or *Santalum*. This study, which he proposes to make at the proper season, will enable him to settle beyond doubt in what degree these plants are parasitical. Do they take part of their nourishment from the soil? Do all their radical fibres produce suckers? What is the duration of the suckers? A prolonged study is required for the solution of all these questions. It may be stated meanwhile, that the subjects attacked by *Osyris* do not appear to suffer much from its presence, and fulfil as usual the vegetative and reproductive functions.

XXVI.—*On some Sections of the Upper Lias recently exposed at Nailsworth, Gloucestershire.* By JOHN LYCETT*.

So few opportunities are afforded for examining the Upper Lias of the Cotteswolds, so small are the artificial exposures of the stage occasionally made, so limited their extent and depth, that its fossils are almost unknown, and even the thickness of the stage has been very variously estimated. During the author's experience of more than twenty years, the Upper Lias has only been known to him by small sections in clay-beds used for brick-making, and these are usually quite destitute of fossils; some cuttings, therefore, recently made, which exposed the entire thickness of the stage and many of its fossils, have induced him to prepare the present brief notice.

* Presented to the Cotteswolds Naturalists' Club, July 21, 1858.

The only authorities for the Upper Lias of the district are—‘*Outlines of the Geology of England*’ by Conybeare and Phillips, 1822; ‘*Outline of the Geology of the Neighbourhood of Cheltenham*,’ by Sir R. I. Murchison, 1834; the enlarged edition of the latter work by J. Buckman and H. E. Strickland, 1845; ‘*Memoirs of the Geological Survey of Great Britain*,’ ‘*The Geology of the Country around Cheltenham*,’ by E. Hull, Esq., 1857. In the first of these works the Upper Lias is only distinguished from the other members of the same formation by a useful section given at page 252, exhibiting the succession in the beds upon the western slope of the Cotteswolds at Painswick Hill, by the late Mr. Halifax of Standish; but their thickness is not given. The following is the section, to which figures are here added to mark the superior divisions:—

Inferior Oolite	1
Very micaceous sand	2
Sand, with beds of unctuous, slaty, bluish clay	3
Blue clay with septaria.....	4
Thin beds of grey Lias-like marlstone.....	5
Lenticular balls of indurated marl with Ammonites and parts of Fishes	6
Marly sandstone, a yellowish-brown sandstone, spangled with mica, blue at the heart, abounding with large Belemnites, Pectens, &c.....	7
Marl and clay	8
Clay, with veins of foxy earth containing ferruginous nodules concentrically formed round a nucleus of Lias.....	9
Lias.....	10

1. The lower portion of the Inferior Oolite; thick beds of coarse, calcareous, shelly gritstone, more or less tinged with oxide of iron.

2. The sands of the *Cynocephala*-stage, with a shelly band at the top, some flaggy argillaceous sandstones in the middle, and a shelly band at the bottom.

3, 4, 5, 6. Upper Lias ; no fossils visible in this section.

7. Marlstone or Middle Lias.

8, 9, 10. Lower Lias ; but little exposed.

In Sir R. I. Murchison's little sketch of the 'Geology of Cheltenham,' the thickness of the Upper Lias is estimated at 60 or 70 feet ; and the following fossils were collected by him from a road-side cutting near Sandywell Park :—*Ammonites bifrons*, *A. undulatus*, *A. annulatus*, *Belemnites acutus*, *B. tubularis*, *B. penicillatus*, *Inoceramus dubius*, *Plicatula spinosa*, *Trochus bisectus*, *Arca*, *Gervillia*, *Lucina*, ?*Modiola*, *Nucula*, *Nautilus*, *Pholadomya*. In the second and enlarged edition of the same work, the authors estimate the general thickness of the Upper Lias at 100 feet ; to the fossils given in the former edition are added the following :—*Ammonites falcifer*, *A. Strangwaysii*, *Belemnites Bruguierianus*, *Trochus bisertus*, *Nucula rostralis*, *Æschna Brodiei*, *Astacus*, *Hippolita*, *Cidaris minuta*. In the memoir by Mr. Hull, the Upper Lias is stated to be upwards of 230 feet thick at Leckhampton Hill ; it is estimated to be 300 feet at Cleeve Cloud ; in the hills further northwards, at from 80 to 100 feet ; it constantly declines in thickness towards the Oxfordshire boundary of the county, so that at Burford its thickness is only 6 feet. In the southern portion of the Cotswolds it is stated to be only 10 feet thick at Wootton-under-Edge, and about 30 feet at Stroud ; but I shall have to show that at Nailsworth, a spot situated between the two latter places, the thickness of the Upper Lias is upwards of 105 feet. The only additional fossils mentioned by Mr. Hull are *Nautilus inornatus* and *Belemnites abbreviatus*.

The sections upon which the present remarks are founded were made in forming several deep drains and a cutting for a carriage-drive upon a steep hill-side preparatory to building a villa and laying out the surrounding ground for ornamental purposes, upon the western side of the valley, and immediately adjoining the village of Nailsworth ; it also happened about the same time that a cutting was made along the whole course of the turnpike road in the same valley, towards Stroud, for the purpose of laying down gas-pipes ; another small section was also afforded by some alterations made in the mill-stream at Holcomb Mills, about half a mile higher up the valley. The deep-drain sections afforded a view of the higher beds of the stage, even to their junction with the micaceous marly sands of the *Cynocephala*-stage ; the other cuttings exposed the lower beds, but less perfectly than the upper ones, and also some portion of the Marlstone series. But although a portion of nearly the whole of the beds was uncovered, the entire area from which

fossils could be procured was very inconsiderable. In descending order occurred—

* Several feet of blue clay, with intercalated thin layers of dark-coloured shale.

A thin stratum of grey, finely laminated shale, with clusters of valves of *Posidonia Bronnii*.

Brown and blue clays and marly bands containing some irregular layers of hard shale, and of thin bands of blue argillaceous limestone.

Fossils were moderately abundant in the bands of limestone. *Ammonites bifrons* was the most conspicuous; *A. communis* was in much smaller numbers; the few other Ammonites obtained consisted of *A. falcifer*, *A. heterophyllus*, *A. cornucopiæ*, *A. crassus*, *A. Lythensis*, *A. Jurensis*, and a new species near to *A. Humphriesianus*; a few fragments occurred apparently of *Nautilus sinuatus*, and a single specimen of *N. latidorsatus*. *Belemnites* were comparatively few, as were also Gasteropoda and Conchifera; the latter included two undescribed species, one of *Tancredia* and one of *Placunopsis*.

In the lower beds bluish-grey clays predominated; but the sections were insufficient to expose an unbroken sequence of the lower beds, although the entire thickness of the stage was ascertained with a near approach to accuracy; the measurement gave a thickness of 105 feet, the beds being free from disturbance. Some few layers of limestone nodules occurred, but their amount was not comparable with those obtained from the Upper Lias of Somersetshire. To the same general deficiency of lime, as exemplified in the paucity and thinness of the limestone bands, may probably be attributed the general scarcity of fossils when compared with the Upper Lias of Somerset; here the chief mass of the deposit consisted of brown and blue clays which were quite destitute of fossils; no remains of Saurians or of Fishes were observed. These conditions present a remarkable contrast to the same stage at Ilminster, with its pale yellow limestone charged with Saurians, Fishes, and a multitude of Mollusca of all classes, numbering probably more than 150 species, notwithstanding that the entire thickness of the stage is only a few feet at that place. To study these, the extensive collection of Mr. Moore, in the Bath Museum, should be visited.

The occurrence at Nailsworth of finely laminated shales with the little *Posidonia Bronnii* in the upper portion is interesting, as identifying the stratum with the continental representative of the same shale: this fragile bivalve appears to be limited to the single stratum indicated.

The large *Tancredia* is the first recorded example in the Lias

of England, although upwards of eleven species are distributed throughout our Lower and Upper Oolites; in France and Germany, on the other hand, nearly all the recorded species are Liassic. It is probable, however, that some, or even all of the shells referred to *Tellina* in the "Etage Bathonien" of D'Orbigny belong to the genus *Tancredia*, excluding the two species in his "Etage Bajocien," which belong to the genus *Quenstedtia*.

The following is the limited list of Upper Lias Testacea procured at Nailsworth:—

Cephalopoda.

- Ammonites bifrons*, Brug.
- *falcifer*, Sow.
- *communis*, Sow.
- *heterophyllus*, Sow.
- *cornucopiæ*, Y. & B.
- *Jurensis*, D'Orb.
- *Lythensis*, Y. & B.
- *crassus*, Phil.
- *annulatus*, Sow.
- *Ilminstrensis*, n. sp.
- Belemnites compressus*, Voltz.
- *tripartitus*.
- Nautilus latidorsatus*, D'Orb.
- *sinuatus*, Sow.

Gasteropoda.

- Pleurotomaria*.
- Turbo capitaneus*, Münster.
- Conchifera.**
- Astarte lurida*, Sow.
- Lucina*?
- Tancredia læviuscula*, n. sp.
- Posidonia Bronnii*, Münster.
- Placunopsis sparsicostatus*, n. sp.
- Nucula Hausmanni*, Ræm.
- Pecten*.
- Gresslya gregaria*, Ræm. sp. (G. Anglica, Ag.)
- Lima gigantea*, Sow.
- *bellula*, Mor. & Lyc.

Notes on the Testacea.

Ammonites bifrons. A variety with compressed sides, in which the falciform ribs are but little prominent. A few examples occurred of the ultimate condition of growth, in which state it may readily be mistaken for a distinct species, and probably constitutes the *A. Hildensis* of Simpson. The costæ have disappeared upon the whole of the last volution, which presents only densely arranged fine falciform lines which pass over the back and the keel; the lateral sulcation has become indistinct through the flattening of the sides of the volution; the back has lost its rectangular figure and become rounded, sloping obliquely upon each side from the keel, and the two dorsal grooves have disappeared; the keel itself has become more elevated and conspicuous. The inner or smooth portion of each volution overwraps and conceals the costated portion of the preceding volution, so that the entire aspect of the shell is smooth, and it is only by breaking away a portion of the last volution near to the suture that the ribs of the next volution can be exposed and the identity of the species proved. It occurred abundantly.

A. communis. Specimens were indifferently preserved, but exhibited some of those varieties in the arrangement of the dorsal ribs, and in the general figure, which perplex collectors who

desire to separate them into the forms named *A. communis*, *A. Hollandrei*, and *A. Braunianus*,—a perplexity which is in no degree lessened by the study of numerous specimens. Further investigations into these forms are desirable.

A. heterophyllus. Badly preserved examples, and few.

A. cornucopiæ (*A. fimbriatus*, Sow.). A single fine example in one of the higher beds. Some casts of young forms, apparently of this species, have been procured in the lower zone of the *Cynocephala*-stage at Nailsworth.

A. Jurensis. Fragments only in the higher beds.

A. crassus (*A. Raquinianus*, D'Orb.). Evidently the same shell as in the lower zone of the *Cynocephala*-stage at Nailsworth and in the Upper Lias of Yorkshire.

Ammonites Ilminstrensis, n. sp.

In its general figure it is scarcely to be distinguished from *Ammonites Humphriesianus*; the style of its ornamentation is also very similar to that of the latter species; there are, however, some well-marked differences. In *A. Humphriesianus* the lateral costæ form, with the dorsal, a curvature more or less marked; in the Lias shell, the ribs pass from the suture straight over the sides and back. Usually two, but sometimes three, dorsal ribs unite with one lateral rib. In *A. Humphriesianus* the number of dorsal ribs is somewhat greater; but the most conspicuous distinction consists in the form of the dorsal ribs, which in the Lias shell are much more narrow, elevated, and acute, so that there is a wide space left between each rib. In the young shell the lateral ribs are likewise much elevated and acute, so that they are little larger than the dorsal ribs; there is also some little distinction in the figure of the volutions, and consequently of the aperture, the portion near to the suture overhanging the preceding volution more than in the Inferior Oolite shell.

The septa consist of three large principal lobes, much produced, and of two small accessory lobes. The dorsal lobe is much lengthened, with a single, terminal, very elongated and pointed digitation upon each side of the mesial line; there are two smaller lateral digitations; all the digitations are indented. The superior lateral lobe has its termination trifurcate, the mesial digitation being pointed, and of immense length; but the lobe altogether is less lengthened than the dorsal lobe. The inferior lateral lobe is similar in figure to the superior lobe, but is much smaller and shorter. The two accessory lobes are very small and simple, the second being nearly concealed by the convexity near to the suture. The dorsal saddle is of great width, consisting of two principal divisions, of which the outer is much the larger;

each division has two principal branches with numerous indentures. The lateral saddle has two principal portions, of which the outer is the smaller; the indentures are smaller and less conspicuous than in the dorsal saddle. The accessory saddles are small and simple, almost without indentures.

Ill-preserved specimens occurred rather abundantly at Holcomb, associated with *A. bifrons* and *Astarte lurida*. My friend Mr. Moore has favoured me with fine specimens from the pale-yellow bed of the Upper Lias at Ilminster, and smaller forms of the same species occur in the lower shelly zone of the Cynocephala-stage at Nailsworth. The largest specimen in my possession has a diameter of $2\frac{1}{4}$ inches; the height of the aperture is 6 lines, the opposite diameter 10 lines.

A. falcifer. A few specimens. At Stroud, when the railway was being constructed, a thin band of pale grey limestone was crowded with fine specimens, to the exclusion of all other species.

A. annulatus, Sow. Few, and ill-preserved.

A. Lythensis, Y. & B. Smaller forms than occur at Whitby. It is not the *A. Lythensis* of Quenstedt; the latter is a very different Ammonite.

Belemnites compressus, Voltz. Large specimens in the upper bed, associated with *B. tripartitus*.

B. tripartitus, Schl., agrees with specimens in the Cynocephala-stage at Nailsworth and at Frocester Hill.

Nautilus latidorsatus, D'Orb. (*N. Toarcensis*, D'Orb.; *N. Jurensis*, Quenst.). A single fine specimen.

N. sinuatus, Sow. Fragments only.

Pleurotomaria. Species undetermined, with elevated spire, narrow convex volutions, mesial siphonal rib, and fine, densely arranged, equal encircling lines.

Turbo capitaneus, Münst. Its aspect agrees with specimens from the Cynocephala-stage in the neatness of the ornamentation.

Gresslya gregaria, Roem. A large tumid species, well separated from congeneric forms. A single specimen.

Tancredia leviuscula, n. sp.

A large elongated species, with an oblique dorsal angle and the posterior border nearly closed. Compared with allied forms, it is more lengthened and less convex than *T. donaciformis*; the anterior extremity is more rounded; the umbo is but little elevated, the posterior side being much extended and its extremity pointed; the height being only equal to $\frac{6}{10}$ ths of the length. It is distinguished by the same features from *T. Deshayesea* and *T. compressa*. A single fine specimen.

Lima gigantea, Sow. This well-known shell occurs both in the Lower and Upper Lias of Gloucestershire. D'Orbigny has separated the older form under the name of *L. edulis*. I do not perceive that the latter possesses any sufficient specific distinction.

Lima bellula, Mor. & Lyc. Delicately preserved, and exhibiting the finely ornamented surface, which is rarely seen in Inferior Oolite specimens. Some of the latter attain larger dimensions and have a somewhat shorter figure, but do not possess any other distinguishing feature.

Placunopsis sparsicostatus, n. sp.

Shell flattened, suborbicular, oblique; umbo raised, submarginal, the surface with numerous irregular, unequal, concentric plications, and a few raised, equal, linear, distant, undulating and radiating ribs, sometimes slightly knotted where they pass over the plications. Diameter 12 lines. A single good specimen.

Nucula Hausmanni, Rœm. Nearly allied to *Nucula Erato*, D'Orbigny, an Inferior Oolite shell both of Yorkshire and Gloucestershire; but the latter species is less angular, less pointed at the extremities, or more ovate and smaller. A single fine specimen.

Posidonia Bronnii, Münt. A delicate papyraceous and somewhat irregular shell, usually indifferently preserved, but occurring throughout a thickness of about two inches in tender, thinly laminated shale. Impressions are abundant, but the test is rarely preserved.

Astarte lurida, Sow. So numerous are the Jurassic species of *Astarte*, and in many instances so nearly allied are they to each other, that the utmost care and precision is necessary, both in descriptions and figures, to convey clear and correct ideas of them in the absence of the fossils; nor under any circumstances can the varieties of aspect which they assume, and the boundaries between species, be in every instance sufficiently defined. The figure of *Astarte lurida* in the 'Min. Conch.' accurately represents a short specimen in the young state, before the arrests of growth had produced irregularity and inequality in the encircling ribs, the verbal description appended being very concise. The following description is the result of an examination of a multitude of specimens in every stage of growth:—

Shell oblique, ovate, moderately convex; umbones anterior, pointed, and incurved; anterior side very short; lunule large, striated, elliptical, excavated, its margin slightly rounded; ligamental margin lengthened, its outline somewhat curved, forming with the other valve a lengthened, smooth, but not deeply exca-

vated area with acute borders; lower margin elliptically curved, internally crenulated. Surface with elliptical costæ, regular in the young shell, subsequently degenerating into irregular and unequal elevations, more especially when the surface exhibits arrests of growth; the costæ are not much raised, rounded, and fully equal in breadth to the interstitial spaces (about thirty-two in a full-grown specimen); the entire surface has fine striations, which follow the direction of the costæ.

Specimens vary much in their length and obliquity; but none are comparable to the Oxford Clay shell figured in the 'Illustrations of the Geology of Yorkshire' under the name of *Astarte lurida*: the large anterior side and the small lunule mark the latter as a distinct species.

Several examples of *Astarte lurida* were obtained in the upper portion of the Upper Lias in a mill-stream cutting at Holcomb; it has also occurred very abundantly a little higher in the geological scale, in the lower zone of the Cynocephala-stage at Nailsworth. D'Orbigny ('Prodrome') places it in his "Étage Bajocien," which is probably an error; the English localities cited by him (Fox Hill and Taunton) are not Inferior Oolite; nor does it appear that the latter formation, although so rich in the genus *Astarte*, has ever produced *A. lurida*.

XXVII.—Description of a new species of Grass Finch from New Caledonia. By JOHN MACGILLIVRAY, F.R.G.S.

To the Editors of the Annals of Natural History.

GENTLEMEN, Port de France, New Caledonia, May 18, 1858.

During my short residence at this portion of New Caledonia, I have had the opportunity of collecting and preparing a few specimens of birds, one of which is of sufficient interest to induce me again to become a contributor to the 'Annals and Magazine of Natural History,' by sending you a brief notice of a new Finch, which I propose to name *Poëphila Paddoni*, in honour of Capt. James Paddon,—not because he has done so much in promoting civilization among the islands of the S.W. Pacific, but because he has at all times cordially assisted Botanists and other Naturalists who, like myself, have visited his stations at Aneiteum, Tana, the Isle of Pines, and New Caledonia. This *Poëphila* interests me especially as being a member of a genus hitherto considered as exclusively Australian as *Eopsaltria*, *Tropidorhynchus*, *Ptilotis*, *Acanthiza*, and *Zosterops*, now for the first time recorded as being found in New Caledonia. The Finch in question more resembles the Australian *P. mirabilis* (of Hombr. and

Jacq. in 'Voy. of Astrolabe and Zélée'), which also I believe to be specifically identical with *P. Gouldiæ*, than any other described species, especially in the scarlet and green of its beautiful plumage.

Poëphila Paddoni, J. M^cG. Rostro nigro; fronte, sincipite, gula, pectoreque phœniceis; uropygio pennisque duobus centralibus caudæ supra rubro-phœniceis; loris cæruleo-viridibus; cæteris partibus corporis metallico-viridibus; tarsis, digitis et unguibus atro-fuscis.

Mas. Rostro 0·3, ala 2·25, cauda 2·0; toto corpore 4·1 in long. uncie Angliæ.

Hab. in Nova Caledonia, præsertim apud insulam "Nu" dictam.

By publishing the above contribution, you will oblige,

Gentlemen, your most obedient Servant,

JOHN MACGILLIVRAY.

XXVIII.—*Descriptions of some apparently unrecorded species of Longicorn Beetles, belonging to the genera Phrissoma, Nyphona, &c.* By ADAM WHITE, Assistant, Zool. Dept. Brit. Mus.

Phrissoma amycteroides, n. s.

Gen Phantasie

Ph. glabrum, nigrum; thorace medio tuberculo magno postice furcato; elytris singulis lineis tribus spinarum crassarum; tibiis apice brunneo-pilosis.

Smooth, black, shining; last eight joints of antennæ with short brownish pile; lateral spines of thorax sharp, placed forward; between them, in the middle, is a high tubercle, rounded in front and on the top, forked behind; elytra slightly scabrous, each with three longitudinal lines of sharp spine-like tubercles, those of the outer row the smallest; elytra at the widest part not much broader than between the tips of the thoracic spines; tibiæ at the end covered with short light-brown hairs.

Length 8 lines.

Hab. Port Natal. (Coll. Gueinzus, in Mus. Brit.)

This longicorn beetle has much resemblance, at first sight, to some of the spined species of the Australian Curculionidous genus *Amycterus*.

Phantasie

Phrissoma Hipporhinus, n. s.

Ph. pilosum, fuscum, nigro variegatum; thorace medio tuberculo magno postice emarginato; elytris thorace multo crassioribus, tuberculatis, singulis lineis tribus tuberculorum cæteris paulo majorum.

Pale brown, not very thickly pilose, with small scattered black

patches devoid of hairs; body large and wide in proportion to the head and thorax; first joint of antennæ rugose; thorax in the middle with a highly elevated tubercle, which is deeply emarginate, almost forked behind; elytra very convex, with the surface more or less thickly covered with small tubercles, with three longitudinal lines of slightly larger tubercles, which do not reach the apex; abdomen beneath blackish, segments interruptedly margined with pale brown; legs thickly clothed with pale brown hairs, of a rich yellowish brown at the tips of the tibiæ.

Length $12\frac{1}{4}$ lines.

Hab. Port Natal. (Coll. Gueinzus, in Mus. Brit.)

This species is allied to the *Ph. denticulatum*, Dej., according to M. Chevrolat. Its specific name is in allusion to a fanciful resemblance it has to a species of *Hipporhinus*.

Phrissoma umbrinum, n. s.

Ph. pilosum; thoracis spinis lateralibus basi latis; elytris, spatio suturali lævi, singulis carinis tribus cristatis, interna mediana brevior, externa longissima.

Of a deep umber-brown, densely pilose; head in front smoothish and punctured; thorax wide, the lateral spines broad at the base; in the middle there is a tubercled elevation consisting of four short rays; elytra somewhat emarginate at the end, the sutural space smoothest; each elytron has three serrated ridges; the shortest has a rather high spine at the base, and reaches only to the middle; the central keel is a little longer than the inner one, while the outer is the longest of all; the antennæ and the legs have some scattered bristly grey hairs.

Length 8 lines.

Hab. Port Natal. (Coll. Brit. Mus.)

Phantasma

Phrissoma terrenum, n. s.

Ph. pilosum, pallide fuscum; thorace supra quadri-tuberculato, tuberculis fossis profundis separatis; elytris profunde et scaberrime punctatis, singulis tricarinatis. *fræpæ ultimæ carinæ: tri angulæ*

Densely covered with a pale brown sponge-like clothing of short hairs; head with the brow swollen and deeply grooved down the middle; thorax above with four tubercles, separated from each other by a transverse and a longitudinal groove, two on the fore margin, two in the middle; the back part is irregularly and deeply pitted; the surface of the elytra is irregularly and very deeply punctured, each elytron having three keels, slightly crenated on the ridge, the innermost the shortest;

abdomen on each side with two rows of paler-coloured spots; antennæ with the second, third, and fourth joints thickened.

Length 10 lines.

Hab. S. Africa (Dr. Andrew Smith). In Coll. Brit. Mus.

Leptrodera morimoides, n. s.

L. scabra et subtuberculata, fusco-brunnea; oculis angustis; cervice nigro transversim quadrimaculato; elytris singulis basi quadratis, plagis duabus nigris ochraceo marginatis, una ad basin, altera majore ad latus postice emarginata.

Rough, subtuberculated, and of an earthy-brown; eyes narrow; head with the surface irregularly pitted; the back part with four small black spots arranged transversely, a yellow spot between the outer and the inner; thorax scabrous, and deeply punctured and wrinkled, with a transverse impressed line a little behind the fore margin; elytra tuberculated, tubercles small, posterior part smoothish, the shoulder squarely angled; each elytron has two black, smooth, velvet-like spots slightly margined with ochreous, one a little behind the base, neither touching the side nor the suture; a larger black spot behind the middle, notched behind, its outer side on the margin of the elytron; elytra when closed having a notch between them.

Length 10-12 lines.

Hab. Silhet. (Coll. Brit. Mus.)

Nyphona thoracica, n. s.

N. latiuscula, griseo-subfuscula; capite antice emarginato; mandibulis antice planis et politis; thoracis dorso tuberculis duobus magnis, supra apicibus tribus, inter tubercula linea brevi profunde impressa; scutello lateribus albis; elytris singulis medio basi pilorum crista elongata, medio late sed obscure pallido fasciato, maculis punctisque paucis fuscis; elytris apice et lateribus postice ciliatis; pedibus et corpore infra subrubidis; abdominis segmentis medio basi obscuris; tibiis apice late fuscis; omnibus rectis et simplicibus.

Rather broad, of a griseous brownish hue, very densely covered with hairs; the mandibles in front flattened, black, polished; the head between the antennæ widely notched; thorax narrower than the elytra; back of the thorax with two large tubercles occupying most of the upper part of the thorax, each with three smaller tubercles; between the tubercles is a short deeply impressed line; the scutellum has the sides white; each of the elytra has near the base a longitudinal crest of longish hairs, with one or two other small obscure tufts, and the shoulders as well as base are rather deeply punctured; across the middle there is a very wide but indistinct palish band, traversed by three or four reddish longitudinal lines; the end of the elytra

and the hind part of the margin are ciliated; the legs and the under parts have a kind of pinkish hue; the tibiæ at the end are widely tipped with brown; the abdomen has the segments brown in the middle at the base.

Length $9\frac{1}{4}$ lines.

Hab. N. India. (Coll. Brit. Mus.)

A more obscure specimen from Silhet, seemingly of the same species, is 2 lines shorter.

Nyphona plagiata, n. s.

N. grisea, punctata; elytris macula magna subtriangulari fusca antice albido cincta; elytris singulis medio lineis duabus brevibus nigro-fuscis, apice truncatis confertim ciliatis; thoracis lateribus lævibus.

Griseous, punctured; antennæ with the third and fourth joints punctulated with white; greater part of the thorax above rugose and deeply punctured, front margin smooth, lateral margin without tubercles; elytra in the middle at the base with an elongated tubercle, covered above with short hairs; about the middle of the elytra and on the suture there is a largish brown mark, triangularly pointed in front and margined with whitish; the side of it, about the middle of each elytron, with two short deep brown lineolets, the outer one the widest; the tip of each truncated, thickly covered with cilia; under side cinereous, sides ochraceous; inside of the legs greyish, outside ochraceous.

Length $7\frac{1}{4}$ lines.

Hab. E. Indies. (Coll. Brit. Mus.)

Nyphona parallela, n. s.

N. grisea; elytris fuscis, sutura late et margine anguste griseis; elytris fusco punctatis; thoracis lateribus subtuberculatis.

Griseous, elongated, somewhat parallel; head with a narrow line down the middle devoid of hairs; thorax rugose, deeply punctured; down the middle is a slightly raised keel, which has an impressed line down it behind; the sides of the thorax are somewhat tubercular; the elytra are punctured and deep brown, the suture is widely margined with griseous, the sides are narrowly bordered with the same; down the middle of each are three slight keels; the apex of each is bimucronate and hairy; under side and legs griseous, and somewhat dotted with brown.

Length 6 lines.

Hab. N. India. (Coll. Brit. Mus.)

Nyphona lateralis, n. s.

N. rubido-grisea, punctata; elytris singulis ad marginem ante me-

diam partem macula rotundata alba; thorace medio fossis duabus profundis postice subdivergentibus, lateribus simplicibus.

Griseous, with a pinkish hue, rather roughly punctured, some of the punctures brown; antennæ with the joints at the base cinereous, at the tip brown; thorax in the middle with two deep longitudinal fossæ not reaching the fore margin, and slightly diverging behind; sides of thorax simple; elytra punctured, covered with pinkish-grey short hairs; on the side margin, just before the middle of each elytron, is a large roundish white spot; elytra at the tip truncated, suture and margin mucronate; middle of abdomen and inside of legs grey; under side of thorax, margin of abdomen, and outside of legs tinged with pinkish.

Length 8 lines.

Hab. Silhet. (Coll. Brit. Mus.)

Nyphona delicatula, n. s.

N. læviuscula, punctata; thorace subtuberculato; elytris basi obscuris, punctatis, medio tuberculatis brevi piligeris; elytris fusco submaculatis, apice rubido subreticulatis; antennis pedibusque subrubidis fusco annulatis.

Smoothish, the upper surface grey, mottled with different shades and markings of brown and pink; sides of the head and two spots on the crown pinkish; antennæ with the first joint brown at the base and pinkish at the tip, the other joints pinkish at the base and brown at the tip; the thorax punctured, slightly tuberculated, with three indistinct brownish bands down the middle; elytra each with a brown band at the base, with four short pinkish lines behind it, and a pinkish spot near the scutellum; the base in the middle is somewhat tubercled, with shortish hairs; the general surface is greyish, spotted here and there with brown; the apex of each elytron is somewhat reticulated with pinkish; the tip and hind part of the margin are ciliated; the legs are pinkish, and ringed with deep brown; the abdomen beneath down the middle is spotted with black.

Length $8\frac{1}{2}$ – $9\frac{1}{4}$ lines.

Hab. Silhet. (Coll. Brit. Mus.)

Nyphona cylindracea, n. s.

N. angustata, cylindracea, canescens; antennarum articulis fusco punctatis, articulo tertio subarcuato; thorace lato, supra, medio excepto, tuberculato, lateribus singulis bidentatis; medio linea brevi impressa; scutello fere lævigato, apice medio impresso; elytris singulis humero fusco foveolato, medio basi fasciculato; elytris apice trimucronato; femoribus anticis incrassatis, supra subcrissatis; tibiis anticis curvatis et infra ad apicem uni-spinosis.

Narrow, cylindrical, hoary; thorax nearly as wide as the ely-

tra; upper surface, except in the middle, irregular and tubercled; each side with two teeth, the anterior the larger; down the middle is an abbreviated impressed line; the scutellum is smoothish, and with an impressed point at the apex and a line at the base; the elytra at the shoulder are brown and somewhat foveolated, and have a widish tuft of hairs, with two or three smaller tufts; the general surface is indistinctly foveolated, and there are two indistinct paler bands across each; the tip of each is somewhat trimucronated and rather thickly ciliated; the antennæ are punctured with brownish, the third joint is somewhat arcuated; the femora of fore-legs are considerably thickened, somewhat crested above; the tibiæ are incurved, and have a spine on the lower side near the tip; the sides of the body beneath are somewhat ochraceous.

Length $8\frac{1}{2}$ lines.

Hab. E. Indies. (Coll. Brit. Mus.)

Sympheletes subtuberculatus, n. s.

S. griseo-cinereus; thorace medio supra subtuberculato; elytris basi tuberculis paucis parvis nudis; antennis postice subciliatis.

Covered with ashen-grey hairs; the margin of the elytra with a palish mark behind the shoulder and an obscure irregular band behind the middle, and with a few small tubercles arranged in two lines; thorax in the middle above with a few slight tubercles covered with hairs.

Length $7\frac{1}{4}$ lines.

Hab. Australia. (Coll. Brit. Mus.)

There is a variety of this, tinged with an ochreous hue, in which the transverse band of the elytra is quite invisible; the tubercles of the elytra also are nearly concealed among the hair.

Sympheletes humeralis, n. s.

S. griseus, ochraceo punctatus; elytris subtuberculatis, tuberculis nudis, humeris nigro-fusco plagiatis, apice truncatis; capite thoraceque punctatis.

Rather thickly covered with greyish hairs, and varied with small ochreous spots; head rather deeply punctured; antennæ cinereous, joints behind rather thickly bordered with blackish hairs; thorax punctured; elytra with the base more thinly furnished with grey hairs, and a deep brown naked patch below the shoulder; the surface of each elytron with several small scattered brown tubercles, the apex truncated; under side rather thickly covered with yellowish-grey hairs, the posterior margins of abdominal segments being thickly ciliated.

Length $7\frac{1}{2}$ – $8\frac{1}{2}$ lines.

Hab. Australia (Port Essington). (Coll. Brit. Mus.)

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Nyphona asperata, n. s.*Lamia asperata*, Burchell, MSS.

N. obscure grisea; thorace medio subsulcato; elytris fasciculis plurimis parvis lineatim ordinatis; corpore subtus cinerascete.

Of a dull griseous; thorax with two distant tubercles on each side; they are greyish above; the middle of the thorax is irregular, and down the middle is a slight longitudinal groove; the elytra are punctured, and have many small tufts of brown hairs arranged in interrupted lines; the under surface is paler than the upper part, and is of a cinereous colour; the antennæ are of a dirty brown, minutely speckled with greyish dots.

Length $9\frac{1}{2}$ lines.

Hab. S. Africa (Dr. Burchell).

Phryneta buphthalmus, n. s.

P. thorace supra quadri-tuberculato; elytris vage villosis, fusco-ochraceis, plagis variis fuscis, apice rubris; antennarum articulo basali rubro, articulis cæteris nigro-fuscis, articulis secundo ad quintum postice ciliatis; abdomine subtus miniaceo-rubro, medio nigro-plagiato, latere nigro-maculato.

Eyes very large; head covered with vermilion-red pile; antennæ with the basal joint covered with short vermilion-coloured down, the joints from the second to the fifth behind ciliated; thorax above with four depressed tubercles, two above each spine; elytra with long scattered black villous hairs, ochreous-brown, with large patches of brown; across the middle these constitute a nearly continuous band; the apex is vermilion-red; the shoulder and the sides of the elytra at the base punctured; tibiæ brown; femora covered with vermilion-coloured pubescence; a pointed tubercle between the fore-legs; under side of abdomen vermilion; each joint in the middle at the base with a large black mark, the side with a smaller black spot.

Length 11–12 $\frac{1}{2}$ lines.

Hab. Sierra Leone. (Coll. Brit. Mus.)

This species, in markings and general appearance, has a considerable resemblance, at first sight, to the *Lamia molator*, Fabr. I am not certain that my description of this curious insect has not been anticipated by Mr. Thomson, in a number of the 'Archives' which I have not seen, as he once pointed it out to me as an insect he was about to publish. I described it some years ago. Perhaps this ought to be referred to a new genus; but as Mr. Thomson may have formed a name for its reception, I abstain from describing it as such. Mr. Thomson's descriptions seem sometimes to be drawn from very imperfect specimens; and this species may be distinct from his.

Phryneta fortificata, n. s.

P. pallide fusca; vertice lineis duabus pallidis cruciatis; thorace medio tuberculis mediis; elytris basi et in latere usque ad mediam partem fossulato-punctatis, medio ochraceo oblique bilineatis, apice subrotundatis; abdominis apice subtus linea longitudinali impressa.

Pale brown; head darker; crown with two pale lines crossing each other between the eyes; the palpi ferruginous; antennæ brown, with cinereous reflexions; thorax in the middle with three rounded tubercles, two of them transverse, and one behind the other two, variegated with ochreous and brown; scutellum with a pale V-shaped mark in the middle; elytra with the base and the side for half the length of each elytron covered with deep fossulated punctures; a short ridge in the middle, with a tubercle at the base; about the middle two short oblique ochreous lines, the innermost with a sudden hook at the end furthest from the suture; elytra somewhat rounded at the tip; legs and under side varied with brown; a pale mark on the thorax below the shoulder of the elytra; the apical segment of the abdomen beneath with a longitudinal impressed line; basal segments of abdomen with a pale spot on each side.

Length 10 lines.

Hab. W. Africa. (Coll. Brit. Mus.)

Phryneta cinereola, n. s.

P. pallide cinerea, fusco variegata; oculis parvis; thorace medio sextuberculato, tuberculis quinque in arcu ordinatis; elytris basi scabriusculis, maculis variis fuscis, maculis basi maculisque ad mediam partem fascias fere formantibus; corpore subtus, pedibus et antennis cinereis.

Pale ash-coloured; eyes small; thorax in the middle with six tubercles, five of them arranged in an arcuated line, the other one triangular and notched behind; elytra at the base and with the space about the shoulder deeply punctured and somewhat tuberculated, with brown spots almost forming a band behind the shoulder; the spots about the middle almost form a band; before the tip of each elytron is a brown spot; the apex of each elytron is somewhat rounded; the body beneath, the legs, and the antennæ are ash-coloured, and obscurely marked with ferruginous.

Length 9 lines.

Hab. Port Natal. (Gueinzus, in Coll. Brit. Mus.)

Phryneta ? velutina, n. s.

P. aureo-brunnea, sericeo-velutina; antennis fusco-brunneis; thoracis tuberculis lateralibus supra carinatis; elytris fasciis quinque un-

dati nigro-fuscis alternatim latioribus, apice singulis subrotundatis; corporis lateribus singulis lineis tribus punctorum canorum; pedibus nigro-fuscis; sterno gibbo.

Of a deep brown, with a golden hue and a velvety lustre; antennæ of a dark brown; thorax with the lateral tuberculated angle keeled above, the keel extending over the back of the thorax; elytra at the base excised, each with five transverse deep brown undulating bands, the second and fourth the widest, the first and fifth interrupted, each elytron at the tip somewhat rounded; the under side of the body spotted with cinereous, the spots on the abdomen arranged on each side in three rows; legs of a deep blackish brown; sternum very prominent.

Length $7\frac{1}{2}$ lines.

Hab. Congo. (Coll. Brit. Mus.)

This, with other African species, may form a new genus. The genera of *Longicornus* are very difficult to define.

Phryneta lugens, n. s.

P. nigra, cinereo variegata; antennarum articulis tribus basalibus nigris, 8 ultimis flavis; thorace supra medio gibbo; elytris cinerascens, nigro creberrime punctato et plagiato, singulis apice sinuato-emarginatis; tibiis postice apice ferrugineo ciliatis, tarsis subtus ferrugineis; sterno gibbo.

Black and cinereous; antennæ with the three basal joints black, the other eight yellow; face with short dark cinereous hairs; thorax above gibbous in the middle, the lateral spines blunt; elytra with the ground dark cinereous, very thickly marked and spotted with black, a greyish band across the middle; each elytron somewhat notched at the apex; tibiæ behind ciliated with ferruginous hairs on the apical half; tarsi beneath ferruginous; sternum prominent; under side dirty cinereous, thickly spotted with black.

Length $7\frac{1}{2}$ lines.

Hab. Congo. (Coll. Brit. Mus.)

Coptops leucostictica, n. s.

C. cinereo-fuscula, maculis plurimis vagis albidis; antennarum articulis apice nigris; tibiis apice nigris, femoribus posticis extus medio nigro maculatis; abdomine subtus medio nigro fasciato, fascia dentata.

Covered with a brownish cinereous pile, which, when rubbed, leaves the surface beneath blackish; it is sprinkled with many small, scattered, whitish spots; the tips of the joints of the antennæ are black; the tibiæ are black at the tip, and the femora of the hind-legs have a blackish spot on the outside in the middle;

the abdomen beneath has a black band down the middle, which is dentated on each side.

Length 10–10½ lines.

Hab. Assam. (Coll. Brit. Mus.)

Coptops abdominalis, n. s.

C. griseo-fusca, rubido variegata; abdominis segmento basali flavo distincte marginato, segmentis sequentibus ochraceo submarginatis.

This is a small species, of a griseous brown, varied with small reddish-ochreous patches of hairs; the basal segment of the abdomen is very clearly margined with yellow, the other segments are slightly margined with ochraceous.

Length 5¼ lines.

Hab. Port Essington.

Agelasta bifasciana, n. s.

A. ochraceo et griseo variegata et nigro punctulata; elytris singulis basi unituberculatis et fasciis duabus nigris undatis, antice et postice ochraceo-cinctis; antennis articulis basi cinereis, apice nigris, articulo primo nigro punctato.

Variegated with greyish and ochreous hues, and dotted over with black; each of the elytra at the base with a black tubercle, and two black waved bands, one before, the other behind the middle, and margined in front and behind with ochraceous; two or three black marks between the last band and the tip; on the suture, in some specimens, are a few black spots; antennæ with the joints cinereous at the base, black at the tip, the first joint ash-coloured, spotted with black; under side of body ochreous, spotted and dotted irregularly with black.

Length 8–10 lines.

Hab. Silhet.

Crossotus Natalensis, n. s.

C. griseus, ochraceo subpunctatus; elytris singulis basi fasciculis tribus fuscis, uno humerali, post medium fasciculo altero, et ante apicem subfasciculatis; antennis articulis tribus basalibus postice a basi ad apicem nigro longe ciliatis, articulis quarto quintoque a medio ad apicem longe ciliatis; pedibus, tibiis præsertim, fusco subpunctatis.

Griseous, somewhat pointed with ochraceous; each of the elytra has three fascicles of dark brown hairs, one on each shoulder, another fascicle behind the middle, and before the tip there are two or three indistinct fascicles; antennæ cinereous, joints darker at the tips, the three basal joints with long darkish cilia behind from the base to the tip, the fourth and fifth joints are ciliated with long blackish hairs from the middle to the tip;

legs, but especially the tibiæ, punctulated with brown; front of head and under side of body ochraceous.

Length 6-7 lines.

Hab. Port Natal. (Gueinzus, in Coll. Mus. Brit.)

Pelargoderus Guerinii, n. s.

P. capite cinereo, vittis quatuor nigris; thorace nigro, vittis quinque albis, transversim strigoso; elytris singulis apice subemarginatis cinereo-pulverosis maculis plurimis nigris; abdomine subtus medio nigro, lateribus cinereis nigro maculatis.

Head cinereous; a trefoil-shaped black spot above the mouth; four black vittæ, two behind each eye; thorax black, rather closely transversely striated, with five longitudinal white bands, —a wide one down the middle, a narrow white one on each side of it, and a wide white band on the thorax above the base of the first pair of legs; scutellum white; elytra cinereous, with the ferruginous base shining through, with many scattered black spots, the apex somewhat emarginated; under side of mesothorax whitish cinereous, with two or three black spots on each side; abdomen beneath in the middle black, the sides cinereous and spotted with black; antennæ blackish brown; legs black, with a cinereous hue.

Length 9-13½ lines.

Near *P. tessellatus*, Guér.

Hab. Silhet. (Coll. Brit. Mus.)

Cerosterna Indicator, n. s.

C. nigra, capite vittis duabus albis; thorace supra vittis duabus latis albis; elytris singulis dorso subplano lævi, lateribus punctatis, maculis magnis variis irregularibus ornatis; corpore subtus pilis albidis tecto.

Black; head slightly grooved down the middle, slightly punctured; antennæ with the joints cinereous at the base, black at the tip; back part of the head with two oblique white vittæ; thorax above with two wide white bands, the central vitta smooth, black, its sides slightly punctured; the scutellum with some whitish hairs; the elytra have the back somewhat flattened, smooth, with scattered, nearly obsolete punctures, except where they bend over the sides, the punctures there being deep and more frequent; the tip is white, and there are various large spots or interrupted bands over the general surface; the under side is covered with whitish adpressed hairs.

Length 12 lines.

Hab. India (Maj.-Gen. Hardwicke). (Coll. Brit. Mus.)

The specimen is somewhat rubbed.

Hammoderus albiplagiatus, n. s.

H. elytris apice subacutis (non spinosis); thoracis dorso, lateribus singulis, vittula nivea pone spinam, et puncto parvo; elytris cinereo-fuscis, punctatis, ad basin subtuberculatis, singulis macula nivea basali; plaga laterali irregulari ante mediam partem, plaga altera nivea post mediam, et macula nivea ante apicem, punctulisque paucis niveis, præsertim ad marginem posticam; mesothoracis latere albo unimaculato; abdominis segmento primo lateribus unimaculato.

Of a cinereous brown; the back of the thorax with three small transverse tubercles; on each side behind the spine there is a short snow-white vitta, and a white dot behind the middle tubercle; the elytra are punctured, and at the base are slightly tubercled; they are without punctures on the white spots; the base of each elytron has a largish snow-white spot, neither touching the scutellum nor the shoulder; before the middle and near the lateral margin is a large white mark, the edge of which is somewhat lobed; behind the middle, and with the sides about equally distant from the margin and the suture, is another irregular white mark, and before the apex there is a smaller one; there are a few small white dots, especially on the hind part of the margin of the elytra; when any of the spots are dotted, around the dot there are no hairs; the under side of the mesothorax has a white spot, and there is also a small white spot on each side of the basal segment of the abdomen; the front tibiæ are somewhat sinuated on the inside.

Length $9\frac{1}{4}$ lines.

Hab. Mexico. (Coll. Brit. Mus.)

Hammoderus thoracicus, n. s.

H. fuliginoso-fuscus; vertice sulcato lineis duabus albis antice convergentibus; thoracis dorso scabriusculo lineis tribus albis, mediana subobsoleta, alteris supra spinas laterales, margines anticæ nec posticas tangentibus; elytris ad basin subtuberculatis, apice singulis unispinis; maculis variis irregularibus niveis, abdominis lateribus albido submaculatis.

Of a fuliginous brown; the crown of the head grooved, and with a whitish line on each side of the groove, the two lines converging in front; the back of the thorax somewhat scabrous, with three longitudinal snow-white lines, the middle one nearly obsolete, the side ones thicker, one above each lateral spine, neither reaching to the front nor the hind margin; elytra with the shoulder and the base somewhat tubercled, the tip of each spined; there are some scattered, snow-white, irregular marks, three of them larger than the rest; one of these is before the middle, the second is behind the middle, and the third is before

the tip; each segment of the abdomen below has on the sides a small obscure whitish spot.

Length 11 lines.

Hab. S. America? (H. G. Harrington, Esq.) (Coll. Brit. Mus.)

XXIX.—On *Sarcodictyon catenata* (Forbes).

By P. H. GOSSE, F.R.S.

[With a Plate.]

THE possession of a specimen of *Sarcodictyon catenata* in the highest health and vigour enables me to add a few particulars to what is known of its economy, and to give a figure of its appearance. I should premise that I have not by me the original account of the animal as published by the late Edward Forbes, but only the citation of it by Dr. Johnston in his 'British Zoophytes,' ed. 2. p. 179, and the figures in plate 33. figs. 4-7, which, he states, were copied from Forbes's drawings.

My specimen was obtained on the 8th instant, at Ilam, in this neighbourhood. Having chiselled off several pieces of the perpendicular sides of a sub-cavernous rock at extreme low-water, spring-tide, and plunged them, when brought home, into sea-water, my little son found, while examining them the next morning, several expanded polypes on one of the fragments, which seemed to him new, and to which he called my attention. On examination, I found that they belonged to this interesting species.

The creeping band is about half an inch in length and half a line in diameter, running in an irregularly sinuated direction. Within this space are five polypes, and there are three or four more scattered on the stone, close to the band, but whose connexion with it I cannot trace, nor with each other: they appear isolated. The colour of the band, which has a fibrous texture, is pellucid red; and that of the polypes, when contracted, is opaque pale red. Not one of Forbes's figures (in Johnston) bears more than the most remote and rude resemblance to what I see, with the exception of the right-hand polype in fig. 5 (*op. cit.*), which is a tolerable representation of the contracted condition; too conical, however.

The individual polypes, when in this state, bear a very close resemblance to a minute *Sagartia*: they are invested with a pellucid epidermis, which is thrown by contraction into annular folds. These folds are seen encircling the lower part of the column alone when the animal is fully extended (see Pl. IX. fig. *a*). Expansion takes place in the ordinary mode, the animal gradually taking a columnar form, and at length attaining a height

of rather more than one-fourth of an inch, with a thickness of about one-sixteenth (see fig. *b*).

The disk is surrounded by eight marginal tentacles, which often extend to one-fifth of an inch in length: their bases are thick and contiguous; their figure that of a cone much produced, and terminating in an exceedingly attenuate point. Each tentacle is fringed along each of its two lateral faces with a row of pinnæ, about fourteen in number in each row. These are conico-cylindrical processes, of extreme delicacy, longer in the middle of the row, and diminishing to each extremity.

The pinnæ are hollow throughout, with very thin parietes: their cavities communicate freely with that of the tentacle, of which they may be considered as cæcal appendages. They are composed, like the tentacles, of contractile tissue, doubtless muscular, and are capable of great elongation, or, at pleasure, of reduction to mere warts. The exterior surface of the pinnæ is studded with oblong tubercles, which are set on in a spiral of about five whorls, the extreme tip being invariably crowned by one of globose shape (see fig. *c*). Under the pressure of the compressorium, with a magnifying power of 600 diameters, these tubercles were seen to be composed of granular tissue, enclosing moderately few cnidæ, pointing outwards, and bearing on minute eminences of their surface the fine appendages which my friend Dr. T. Strethill Wright has named palpocils* (see fig. *d*). The cnidæ are ovate, arcuate, and very minute, averaging $\cdot 0004$ inch in length and $\cdot 0001$ inch in thickness. The tubercles have a decidedly spiral arrangement on the pinna, though the pinnæ are strictly bifarious on the tentacle.

Interiorly the pinnæ are richly ciliated; and corpuscles in the peritoneal fluid are seen forcibly driven to and fro by the conflicting currents. The epithelial lining of the tentacles is similarly clothed with cilia; but the currents here are chiefly manifest in the basal region, and their course is regularly downward into the interseptal cavities.

The disk presents nothing remarkable; it is smooth and translucent. The mouth is encircled by a thin lip, which is capable of protrusion in the form of a low circular wall. A good microscopic observation, obliquely down into the stomach, showed me that (on *that* side, at least; I can say nothing of the other) there is one gonidial groove, of which the edges were sometimes brought temporarily into mutual contact for a portion of their length, forming thus a tube, and at other times were widely separated—forming a broad and shallow channel. I could see no appearance of gonidial tubercles. The groove thus seen coincides with one of the extremities of the line which a transverse section

* Edinb. New Phil. Journ. for April 1857.

would present; for the form of the stomach here, as in *Alcyonium* and the *Actinioids*, is that of a flattened sac, or that which a pillow-case would take, supposing it to be suspended longitudinally, and both ends to be unsewed. The inferior extremity of this long sac, which hangs down in the centre of the column, sustained in place by the eight septa, which connect it throughout its length with the column-wall, is entirely open, without the slightest constriction or appearance of a sphincter. It is in fact a little dilated, and runs off into eight produced points, coinciding with the septa, which pass off thence downward toward (and probably to) the bottom of the visceral cavity. The free edges of the septa, below the termination of the stomach, are thickened and much convoluted, each forming doubtless a craspedum; but the distinct sight of their structure is speedily lost in the swollen masses, of an opaque pale-red hue, into which they merge, and which nearly fill the cavity,—doubtless the ovaries.

It is remarkable that the most careful scrutiny failed to detect even a single spiculum in the texture. In *Alcyonium* these deposits are found by hundreds around the neck of the polype and running up into the tentacles, as well as in the skin of the column. But in my expanded *Sarcodictyons* none could be detected in the tissues of the living animal; and examination of the dead proved equally fruitless: for I separated one, pressed it to actual flatness between the plates of the compressorium, and allowed it to dry; then I treated it with a solution of caustic potash (Brandish's); finally I boiled the remains in the potash over a flame for some minutes; but with the most careful search, under a magnifying power of 600, and subsequently of 800 diameters, not a single spiculum appeared. I may observe, by the way, that after these processes the form of the pressed animal, and particularly of the tentacles with their pinnæ, remained perfect, whence I infer that the integument is of a chitinous nature.

On the other hand, the spicula were conspicuous enough in a dried specimen of *Sarcodictyon* similarly treated. Dr. Battersby had kindly given me a fine specimen of this species in the dry state, which he had dredged this summer on the coast of Galway. From this I cut off a small portion of the band including a single polype; and having macerated it in water and subjected it to boiling potash, I found the spicula conspicuous, though not very numerous. They were, in fact, distinctly identifiable with a power of 65 diameters, being on an average .003 inch in length, and some attaining to .0055. These spicula were of a transparent light-red hue, and of that pattern (though varying indefinitely in detail) which I have represented, in my

'Devonshire Coast,' pl. 3. figs. 3 and 4, as possessed by the spicula of *Alcyonium*, resembling "very gnarled branches of oak, with the branchlets broken off, leaving ragged ends." The figure given by Johnston, after Forbes—that of a four-rayed star, with minutely serrated margins—must surely have been a fancy portrait.

The whole of the expanded polype is transparent and colourless*, except the stomach, the craspeda of the septa, and the ovaries, which are opaque and light red. When the animal is contracted, these parts give their hue to the whole then visible, with the exception of the whitish, pellucid epidermis.

My specimens were (and *are*; for they still survive, after nearly three weeks' captivity) by no means "sluggish and shy." They expand very freely in pure water, and remain in full blossom almost the whole of their time. If touched rudely, they withdraw, but do not at all regard the movement of the vessel in which they are kept, nor the pushing hither and thither of the fragment of rock to which they are attached, nor a shock or jar given to the table, nor even a slight touch,—all of which would induce our more coy Anemones to veil their beauties from public gaze. And when they have retired, a very short time—perhaps a quarter of an hour, or less—sees them blossoming again as jauntily as ever. Their manners during expansion are sprightly, as almost every instant one or other of the tentacles, which move quite independently of each other, is bent inward toward the mouth, or jerked hither or thither, or suddenly shortened, or more slowly lengthened. These organs are usually carried arching outward and upward in sigmoid curves, like the branches of a candelabrum (see fig. *a*), imparting a most elegant appearance to this beautiful Zoophyte. The pinnae, too, are continually changing their position and figure by their independent contractions; ordinarily they bend downward and outward from the plane of the tentacle.

After one or two attempts I succeeded in feeding the polypes. The difficulty was in presenting the food in sufficiently minute morsels. I selected the flesh of the earthworm, having found that this is generally agreeable to zoophytic taste, and cut a piece of the integument into very minute atoms. One of these I then passed down on the point of a needle to the *Sarcodictyon*, watching it at the same time through a pocket lens. As soon as contact occurred, the tentacle grasped it, took it from the needle-point, and bending inward, passed it to the disk. Here one and another of the tentacles bent in towards it, all of them

* This is, however, due to distension; for when partially contracted, the septa, and even the skin of the column and tentacles, are seen to have a slight tinge of the same carneous hue.

by turns touching it, and as it were testing it. In the course of a few minutes the lips had closed upon the atom, and it was seen dilating the stomach as it slowly made its way downwards.

Sarcodictyon appears to me to approach very closely to the Helianthoid type. This genus on the one hand, and *Zoanthus* on the other, are probably the links by which the two suborders *Alcyoniaria* and *Actiniaria* are united. I have never had an opportunity of examining *Zoanthus*, but think it probable that isolated calcareous spicula will be found scattered in its tissues.

EXPLANATION OF PLATE IX.

Fig. a. Sarcodictyon catenata: a single polype expanded. Magnified 12 diameters.

Fig. b. The same, of the natural size.

Fig. c. A tentacular pinna. Magnified 85 diameters.

Fig. d. A pinna contracted and crushed flat between the plates of the compressorium. Magnified 250 diameters.

Sandhurst, Torquay, Sept. 27th, 1858.

XXX.—*Characters of some apparently undescribed Ceylon Insects.* By F. WALKER.

[Continued from p. 209.]

Fam. Buprestidæ.

CHRYSOBOTHRYX SUTURALIS. Cupreo-purpurascens, subtus cyaneo-
viridis aureo nitens, frontis lateribus thoracisque margine antico
auratis, elytris basi auratis, sutura cyaneo-viridi. Long. 4 lin.

AGRILUS SULCICOLLIS. Nigro-æneus, thorace transverse sulcato,
elytris punctatis foveolatis, lateribus antice emarginatis. Long.
 $1\frac{1}{2}$ lin.

Fam. Elateridæ.

CARDIOPHORUS HUMERIFER. Niger, capite, thorace et elytris basi
rufis, elytris punctato-lineatis, luteo bifasciatis. Long. 3 lin.

CORYMBITES DIVIDENS. Rufa, capite, antennis, thoracis vitta pos-
tice abbreviata, elytrorum triente apicali abdominisque apice nigris.
Long. $3\frac{1}{2}$ lin.

CORYMBITES DIVISA. Rufa, pubescens, capite, antennis, elytrorum
dimidio fere apicali abdomineque nigris. Long. $4\frac{1}{2}$ lin.

ATHOUS PUNCTOSUS. Niger, dense pubescens, capite thoraceque
confertissime punctatis, antennis pedibusque piceis, elytris punctato-
lineatis. Long. 6 lin.

ATHOUS INAPERTUS. Niger, ferrugineo sordido dense tomentosus,
capite thoraceque subtilissime punctatis, elytris punctato-lineatis,
pedibus rufescentibus. Long. 4 lin.



SARCODICTYON CATENATA.



ATHOUS DECRETUS. Niger, capite thoraceque subtilissime punctatis, antennis piceis, thorace latiusculo, angulis posticis peracutis, elytris scitissime punctato-lineatis postice attenuatis, abdomine pedibusque rufescentibus. Long. $4\frac{1}{2}$ lin.

ATHOUS INEFFICIENS. Ferrugineus, pubescens, capite thoraceque piceis subtilissime punctatis, antennis nigris serratis, elytris scite lineatis vix punctatis. Long. $3\frac{1}{2}$ –4 lin.

Genus **LEGNA.**

Caput antice excavatum. Labrum extensum. Palpi breves, clavati. Antennæ ramis septem sat longis; articulus penultimus intus productus; ultimus breviusculus. Elytra subparallela, postice vix angustiora. Tibiæ subclavatæ, subsulcatæ, vix dilatatæ.

LEGNA IDONEA. Rufo-ferruginea, nitens, antennis, tibiis tarsisque nigris, capite thoraceque fere glabris, elytris rufis, scite sulcatis, sulcis subtilissime punctatis. Long. 9 lin.

Genus **HARMATELIA.**

Colophotia affinis. Antennæ maris ramis longis verticillatis.

HARMATELIA DISCALIS. Testacea, antennis, capite thoraceque nigris, thoracis margine testaceo, elytris nigro quadrivittatis. Long. $2\frac{1}{2}$ lin.

HARMATELIA BILINEA. Testacea, antennis pedibusque nigricantibus, thorace rufescente sulcato subdilatato, elytris nigro bivittatis. Long. 3 lin.

Fam. **Lampyridæ.**

LYCUS GEMINUS. Ater, thoracis marginibus dilatatis incis is elytris- que apud medium dilatatis sanguineis, antennis dilatatis serratis. Long. 5–6 lin.

LYCUS ASTUTUS. Ater, thorace elytris- que sanguineis, thorace carinis tribus dorsalibus (duabus postice) carinaque transversa undulata, elytris inter costas punctatis, triente apicali atra. Long. $4\frac{1}{2}$ – $5\frac{1}{2}$ lin.

LYCUS MELANOPTERUS. Ater, thorace elytris- que sanguineis, antennis latissime serratis, elytris pubescentibus linearibus inter costas punctatis, triente apicali atra, alis nigris. Long. 4 lin.

LYCUS FALLAX. Ater, thorace elytris- que sanguineis, antennis latis non serratis, elytris postice latioribus vix costatis, fascia lata subapicali atra. Long. 4 lin.

LYCUS PUBICORNIS. Ater, thorace, scutello elytris- que sanguineis, antennis pubescentibus latissime pectinatis, elytris linearibus pubescentibus inter costas punctatis, triente apicali atra, costis plurimis. Long. $3\frac{3}{4}$ lin.

LYCUS DUPLEX. Ater, thorace, scutello elytris- que sanguineis, antennis latis serratis, elytris linearibus pubescentibus inter costas punctatis, triente apicali atra, costis paucis. Long. $3\frac{1}{2}$ lin.

- LYCUS COSTIFER.** Ater, capite piceo, thorace elytrisque pallide sanguineis, thorace carinis tribus postice duabus, elytris linearibus reticulatis, costis paucis. Long. 3 lin.
- LYCUS REVOCANS.** Ater, thorace, scutello elytrisque pallide sanguineis, antennis pubescentibus latissime pectinatis, elytris linearibus pubescentibus inter costas punctatis apices versus atris. *L. pubicorni* affinis at distinctus. Long. $3\frac{1}{4}$ lin.
- LYCUS DISPELLENS.** Ater, antennis latiusculis, elytris testaceis angustis linearibus inter costas punctatis apices versus atris. Long. 3 lin.
- LYCUS EXPANSICORNIS.** Ater, capite, thorace elytrisque sanguineis, antennis dilatissimis valde serratis corpore multo longioribus, dimidio basali sanguineo, thorace marginato antice angusto, elytris linearibus inter costas punctatis, costis paucis. Long. $3\frac{1}{2}$ lin.
- LYCUS DIVISUS.** Luteo-testaceus, antennis nigris latis breviusculis basi testaceis, thorace latiusculo utrinque impresso, tibiis nigris, elytris cribratis quadricostatis extus subarcuatis apud apices oblique atris. Long. 4 lin.
- LYCUS PLANICORNIS.** Coccineus, antennis nigris compressis basi testaceis, thorace carinato bisulcato lateribus subdilatatis, elytris vix dilatatis apice nigris, tibiis tarsisque nigris. Long. 5 lin.
- DICTYOPTERA INTERNEXA**, mas. Atra, thorace abdomineque sanguineis, antennis subserratis, thorace postice latiore, elytris sublinearibus cribratis quadricostatis apice atris. Fœm. Lutescens, antennis breviusculis, thorace angustiore, elytris extus subarcuatis. Long. 4–5 lin.
- LAMPYRIS TENEBROSA.** Fulvescens, subtus ferruginea, oculis maximis nigris, thoracis disco nigro, elytris subtilissime cribratis. Long. $7\frac{1}{2}$ lin.
- LAMPYRIS DIFFINIS.** Testacea, oculis maximis nigris, thoracis disco nigro, elytris nigris subtilissime cribratis basi apiceque testaceis. Long. 6 lin.
- LAMPYRIS LUTESCENS.** Lutescens, oculis maximis atris, thorace fascia antica vitrea, antennis, tibiis, tarsis abdomineque (apice excepto) nigris. Long. 7 lin.
- COLOPHOTIA HUMERALIS.** Fulvo-lutescens, capite ferrugineo, oculis atris, antennis tarsisque nigricantibus, elytris basi apiceque piceis. Long. $4-4\frac{1}{2}$ lin.
- COLOPHOTIA PERPLEXA.** Testacea, capite, oculis elytrisque apice atris, abdominis apice pallido, antennis tarsisque nigricantibus. Long. $4-4\frac{1}{2}$ lin.
- COLOPHOTIA INTRICATA.** Testacea, abdominis apice pallidiore, capite ferrugineo, oculis atris, elytris apice piceis, antennis tarsisque nigricantibus. Long. 3 lin.
- COLOPHOTIA EXTRICANS.** Testacea, capite, antennis, thoracis plaga subquadrata, scutello, elytrorum triente apicali, pectore postico,

abdomine pedibusque posterioribus nigris, abdominis apice albido.
Long. 3-3½ lin.

Fam. Telephoridæ.

TELEPHORUS DIMIDIATUS, *Fabr.*? Testaceus, elytris dimidio apicali nigro-cyaneo, antennis tibiisque posticis nigris basi testaceis, abdomine tarsisque nigris. Long. 4-4½ lin.

TELEPHORUS MALTHINOIDES. Ater, nitens, antennis subserratis, thorace luteo. *Fœm.* Elytris non nitidis. Long. 2 lin.

Fam. Melyridæ.

MALACHIUS? PLAGIATUS. Ater, elytris rufis cribratis, basi, apice plagisque duabus cyaneo-atris. Long. 1½ lin.

MALTHINUS PROFICIENS. Niger, capite, antennis basi, thorace pedibusque testaceis, thorace nonnunquam nigricante. Long. 1 lin.

ENICOPUS? FUSIFORMIS. Ater, nitens, subfusiformis, dense pubescens, elytris punctato-lineatis. Long. 1½ lin.

Fam. Cleridæ.

NECROBIA ASPERA. Purpureo-cyanea, dense pubescens, antennis rufis apice nigris, pedibus rufis, elytris rude punctato-costatis. Long. 2 lin.

Fam. Ptinidæ.

PTINUS LEMOIDES. Fulvus, subpubescens, antennis nigricantibus, dimidio basali testaceo, thorace piceo. Long. 1½ lin.

Fam. Diaperidæ.

DIAPERIS VELUTINA. Nigra, velutina, ore fulvescente, antennis piceis basi ferrugineis, corpore subtus pedibusque piceis aut ferrugineis. Long. 2½-3 lin. Platyder

Fam. Tenebrionidæ.

ZOPHOBAS CLAVIPES. Ater, capite linea transversa arcuata impressa, thorace subtilissime et confertissime punctato, elytrorum lineis impressis bene determinatis, rugulis transversis. *Mas.* Thorace vix nitente, tibiis anterioribus apice dilatatis et angulatis, posticis arcuatis. *Fœm.* Thorace opaco. Long. 7-8 lin. Benedict

ZOPHOBAS? SOLIDUS. Ater, oblongus, capite subtilissime punctato, thorace conferte punctato, elytris tuberculato-lineatis. Long. 3½ lin.

UPIS IMPRESSA. Atra, nitens, capite punctato, thorace subobsolete unisulcato, elytris e punctis sat magnis octo-lineatis, femoribus clavatis. Long. 8 lin. Benedict

TENEBRIO RETENTA. Atra, thorace subnitente subtilissime punctato, elytrorum lineis impressis bene determinatis. Long. 5 lin.

Fam. Opatridæ.

OPATRUM CONTRAHENS. Nigrum, supra subtilissime punctulatum et fusco tomentosum, elytrorum lineis impressis sat bene determinatis. Long. 4 lin.

OPATRUM BILINEATUM. Nigrum, præcedente angustius, supra subtilissime punctulatum et fusco tomentosum, thorace foveis duabus parallelis, elytrorum lineis impressis sat bene determinatis. Long. $3\frac{1}{2}$ –4 lin.

OPATRUM PLANATUM. Nigrum, præcedente angustius, supra subtilissime punctulatum et fusco tomentosum, elytrorum lineis impressis sat bene determinatis. Long. 3 lin.

OPATRUM SERRICOLLE. Piceo-nigrum, thorace scabro, lateribus denticulatis, elytris subpunctatis, costis quatuor bene determinatis. Long. $2\frac{1}{2}$ lin.

ASIDA HORRIDA. Ferrugineo-fusca, subtus nigra, thorace elytrisque cribratis tuberculatis et cristatis, marginibus serratis, thorace utrinque profunde inciso. Long. $2\frac{1}{2}$ lin.

CRYPTICUS DETERSUS. Niger, subopacus, ore tarsisque subtus ferrugineis, thorace lævi postice utrinque subimpresso, elytris distincte punctato-lineatis. Long. $3\frac{1}{2}$ lin.

CRYPTICUS LONGIPENNIS. Niger, nitens, thorace subtilissime punctato, elytris subopacis, lineis punctato-lineatis postice bene determinatis. Long. 3 lin.

PHALERIA RUFIPES. Nigra, nitens, ore antennisque piceis, thorace subtilissime punctato, elytris apice piceis, lineis bene determinatis, pedibus rufis. Long. $2\frac{1}{2}$ lin.

TOXICUM OPPUGNANS. Atrum, subopacum, thorace sublævi, elytris distincte punctato-lineatis. *Mas.* Capite cornubus duobus porrectis longis aut breviusculis. *Fœm.* Capite bituberculato. Long. $3\frac{1}{2}$ –4 lin.

TOXICUM BILUNA. *Mas.* Atrum, cribratum, tuberculoso-scabrum, thorace cornubus duobus porrectis arcuatis scabris. Long. 3 lin.

ULOMA SCITA. Badia, nitens, thorace subtilissime punctato, elytrorum lineis punctatis scitissime determinatis. Long. $3\frac{1}{2}$ lin. *Mas.* Thorace antice impresso.

ALPHITOPHAGUS SUBFASCIA. Ater, nitens, antennis ferrugineis, elytris impresso-lineatis, fasciis duabus angulatis luteis, 1^a antica interrupta, 2^a apicali. Long. $1\frac{1}{2}$ lin.

Fam. Helopidæ.

Genus OSDARA.

Sphæroto similis. Corpus subovatum, crassum, convexum. Caput transverse impressum. Palpi securiformes. Antennæ subclavatae, corporis dimidio breviores, articulis apices versus breviori-

bus. Thorax subrotundatus, lateribus incis. Elytra latiora, scabra. Pedes longiusculi.

OSDARA PICIPES. Nigra, thorace subnitido subtilissime punctato, pedibus piceis, elytris rufo-ferrugineis, tuberculis plurimis et variis nigris. Long. 4 lin.

STRONGYLUM VARIABILE. Rubro-cupreum, aut cyaneo-viride, aut æneum, thorace conferte punctato, elytrorum lineis bene determinatis rude punctatis apices versus scitissime punctatis. Long. 6-9 lin.

STRONGYLUM PARABOLICUM. Æneum, thorace scitissime punctato, fovea dorsali, elytrorum lineis impressis distinctis rude punctatis apices versus vix punctatis. Long. 6 lin.

STRONGYLUM LÆVIUSCULUM. Nigro-æneum, subtus læte æneum, capite thoraceque subtiliter punctatis, elytrorum lineis tenuissimis subtilissime punctatis. Long. 6 lin.

HELOPS EBENINUS. Ater, opacus, capite trisulcato, ore ferrugineo, thorace subsericeo, elytrorum lineis impressis optime determinatis strenue punctatis. Long. 3-3½ lin.

AMARYGMUS CHRYSOMELOIDES. Æneus, lævis, subtus niger, pedibus nigro-piceis, elytris æneo-viridibus, lineis octo e punctis bene determinatis. Long. 3½-4½ lin.

Fam. Lyttidæ.

EPICAUSTA NIGRIFINIS. *E. testaceæ* F. affinis. Testacea, sublævis, capite, antennis, elytris apice pedibusque nigris, femoribus testaceis apice nigris. Long. 5½ lin.

MYLABRIS HUMERALIS. Atra, elytrorum strigis duabus humeralibus, maculis duabus basalibus fasciisque duabus angulosis luteis. Long. 9-11 lin.

MYLABRIS ALTERNA. Atra, elytris luteis, macula basali, fascia media, puncto apud suturam fasciaque apicali extus producta nigris. Long. 3½-5 lin.

ATRACOCERUS DEBILIS. Testaceus, capite thoraceque nigro univittatis, antennis nigris, abdomine ferrugineo, alarum venis testaceis. Long. 10-14 lin.

ATRACOCERUS REVERSUS. Niger, thoracis vitta lutea, tarsis testaceis, tibiis posticis testaceo fasciatis, alarum venis nigris. Long. 11 lin.

Fam. CEdemeridæ.

ALLECULA FUSIFORMIS. Nigro-picea, longi-fusiformis, capite ferrugineo, elytrorum lineis impressis punctatis, antennis pedibusque fulvis, femoribus apice nigris. Long. 5 lin.

ALLECULA ELEGANS. Fulva, subfusiformis, thorace subtilissime scabro subtus nigro, vitta dorsali nigra, elytris cribratis et costatis, vittis duabus indistinctis nigricantibus. Long. 3½ lin.

CISTELA CONGRUA. Testaceo-flava, lævis, elytrorum lineis impressis scitis tenuissime punctatis. Long. $4\frac{1}{2}$ lin.

Fam. Mordellidæ.

ACOSMIUS LANGUIDUS. Piceus, cinereo-tomentosus, antennis basi fulvis, thoracis plagis et elytrorum fasciis duabus non tomentosis. Long. 5 lin.

MORDELLA COMPOSITA. Atra, tomento albo varia, thoracis margine lineolisque duabus transversis angulatis, elytrorum maculis decem et abdominis segmentis ventralibus basi albo-tomentosis. Long. $3\frac{1}{2}$ lin.

Fam. Cissidæ.

CIS CONTENDENS. Niger, subpubescens, latiusculus, subtilissime punctatus, elytris vix lineatis, pedibus rufis. Long. $1-1\frac{1}{4}$ lin.

Fam. Tomicidæ.

APATE SUBMEDIA. Atra, scabrosa, subtus picea, capite ferrugineo piloso, elytrorum costis tribus subobsoletis apice bene determinatis. Long. $6\frac{1}{2}-8$ lin.

BOSTRICHUS MUTILATUS. Ater, capite ferrugineo piloso, thorace scabro, elytris punctatis apice bituberculatis et oblique truncatis, antennis piceis, femoribus rufis. Long. 3 lin.

PLATYPUS MINAX. Piceus, cylindricus, sublævis, subtus ferrugineus, capite obliquo, elytris subtilissime punctatis et lineatis, apice truncatis et dentatis, pectore maximo, abdomine brevi, femoribus latissimis. Long. $2\frac{3}{4}$ lin.

PLATYPUS SOLIDUS. Ater, nitens, angustus, thorace vix sulcato, elytris lineis impressis tenuissimis, apice subacuminato. Long. $1\frac{3}{4}-2$ lin.

[To be continued.]

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BIBLIOGRAPHICAL NOTICES.

Weeds and Wild-flowers; their Uses, Legends, and Literature. By Lady WILKINSON. London, Van Voorst, 1858.

ANY one seeking an elegant gift-book, especially for a young lady friend, will be happy to alight upon the volume whose title we give above. Printing, binding, &c., in the fashion of the 'Annuals' of former days, adorn matter far more suited to excite or sustain a healthy appetite for reading than the namby-pamby sentiment which used to shine in the beauties of crimson and gold. At the same time, Lady Wilkinson's book is strictly a readable book: it does not deal with the "ologies" in the *ex cathedra* style. The abundance

of interesting information about common plants is given in the unaffected manner of a lady, too sensible to be a pedant, contributing the results of a more than usually extensive reading to a circle of educated friends.

Poets, of various temper and of various countries, are made to confess their worship of Flora; antiquarianism from most diverse sources, with home and outlandish folk-lore, lend a curious interest to these pages,—while ‘useful information’ finds a due place in the polished piece of ‘inlaid-work’ which a refined taste and good sense have united to produce. Quotation with a view to give a specimen of such a work is out of the question, since everything depends upon the skilful and harmonious blending of the subject-matter, drawn from an infinity of sources.

The work is illustrated by twelve very pretty and faithful coloured drawings of British wild-flowers and twenty-four good woodcuts. It is a volume we gladly see added to Mr. Van Voorst’s list, as an addition to the rather small number of meritorious productions which stand between special scientific works and the science-made-easy trash of the cheap-book manufacturers.

How Plants Grow: a simple Introduction to Structural Botany, with a Popular Flora; or an Arrangement and Description of Common Plants, both Wild and Cultivated. By ASA GRAY, M.D. New York, Ivison and Finney, 1858.

If Botany is to be taught to the million, there need be no long search for suitable means. Three of our English Professors have written A-B-C books on the subject; and here Prof. Asa Gray performs a corresponding service for our American brethren. This work differs somewhat, and for its purpose favourably, from any of our native books,—being as it were a combination of the plans of Henslow’s or Henfrey’s rudimentary books and Lindley’s School Botany, worked-out, however, in a perfectly original manner. The first Part, treating of structural, and, to some extent, of physiological botany, is very skilfully written, and we think must prove an excellent teaching book. The second Part relates of course to the familiar forms of the North American Flora. Here, as in his other works, Prof. Gray uses the Natural System, with an analytical Key, and is quite independent of the Linnæan System. In some of the more important Orders, such as Cruciferae and Umbelliferae, only the genera are given; and in Compositae, Grasses, and Sedges, not even these,—as being too difficult for beginners. On the other hand, the common plants of the gardens of the United States are described with the native species, being distinguished by proper marks.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

March 11, 1858.—Dr. Hooker, Vice-President, in the Chair.

“Description of the Skull and Teeth of the *Placodus laticeps*, Ow., with indications of other new species of *Placodus*, and evidence of the Saurian nature of that extinct genus.” By Prof. Richard Owen, F.R.S. &c.

The author premises a brief sketch of the history of the discovery of the fossils referred by Count Münster, and Professors Agassiz, Bronn, and Meyer to the Pycnodont family of Ganoid Fishes, under the generic name of *Placodus*; and then enters upon the anatomical grounds on which he concludes that the *Placodus* is a Saurian reptile. These are stated to be, principally,—1, distinct external bony nostrils, divided by an ascending process of the premaxillary, and bounded by that bone, the maxillaries and nasals; 2, orbits circumscribed below by the superior maxillary and malar bones; 3, temporal fossæ of great size and width, bounded externally by two zygomatic arches, the upper formed by the postfrontal and mastoid, the lower formed by the malar and squamosal; 4, the tympanic bone formed by one bony piece, with a trochlear lower articular surface; the limitation of the teeth to the premaxillary, maxillary, palatine, and pterygoid bones, in the upper jaw, with a demonstrated absence of a median vomerine series, such as exists in the true Pycnodonts. With these proofs of the reptilian nature of the *Placodus*, Prof. Owen combines others exemplifying its affinities to the Lacertian order, and more especially with that modification of *Lacertia* exemplified by the extinct genus *Simosaurus*, from the Muschelkalk.

The author then describes the dentition of the upper jaw of the specimen of *Placodus*, demonstrating the foregoing characters. It includes two premaxillary and three maxillary teeth, forming an outer or marginal series, and two teeth of larger size, forming an inner or palatal series, the last of which is described as the largest grinding tooth in proportion to the size of the head, hitherto known in the animal kingdom.

From the cranial and dental characters the author deduces the specific distinction of his specimen from previously described *Placodi*, and proposes for it the name of *Placodus laticeps*, in reference to the great breadth of the skull, which equals the entire length, each measuring about 8 inches. All the teeth are implanted in distinct sockets, according to the thecodont type of the Lacertian order. The relation of the large temporal fossæ and of the wide span of the zygomatic arches, to the enormous muscular force required to work the crushing machinery of the jaws, is pointed out.

The structure of the bony nostrils, the orbits, the palate, with other particulars of the cranial anatomy of the *Placodus*, is next described in detail, and compared with the same characters in *Nothosaurus*, *Simosaurus*, *Pistosaurus*, and other Muschelkalk reptiles. The dentition of these Saurians, although, like *Placodus*, thecodont in

respect of implantation, is of the ordinary crocodilian type in respect of form, adapted to the prehension of fishes; and there are no palatal teeth. But the author remarks that such teeth exist in the triassic Labyrinthodonts, with a disproportionate magnitude of certain teeth which offers a certain analogy with the dentition of *Placodus*. An account of the microscopic structure of the dentine, enamel, and osseous tissue of the *Placodus* is then given.

The extreme and peculiar modification of the teeth, in respect to form and size, adapting them to the crushing and pounding of hard substances, and the association of the *Placodus* with conchiferous mollusks in such abundance as to have suggested the terms 'Muschelkalk,' 'Terebratuliten-kalk,' and the like, for the strata containing them, concur in evincing the class whence the *Placodi* derived their chief subsistence; and the author points out the relation of a constant disposition of the teeth, in all the known species, to the readier cracking of shelly substance. A single row of teeth in the lower jaw is always opposed to a double row in the upper one, playing, with its strongest line of force, upon their interspace. Thus the crushing force below presses upon a part between the two points of resistance above, on the same principle on which a stick is broken across the knee; only here the fulcrum is at the intermediate point, the moving powers at the two parts grasped by the hands. It is obvious that a shell pressed between two opposite flat surfaces might resist the strongest bite; but, subjected to alternate points of pressure, its fracture is facilitated.

Certain Australian lizards present teeth with large rounded obtuse crowns, like those of certain *Placodi*, and have on that account received the name of *Cyclodus*, for their genus.

The author next proceeds to describe certain specimens of the mandible or under jaw of the genus *Placodus*. The first of these he refers to a species for which he proposes the name of *Placodus pachygnathus*. The second may probably be the lower jaw of the *Placodus Andriani*, Ag.; but should it prove to belong to a different species, the term *bombidens* would best express the specific peculiarity in the shape of the grinding surface of the teeth. A third species is named *Placodus bathygnathus*, in reference to the great vertical extent of the mandibular ramus.

All the above-described fossils are from the Muschelkalk member of the triassic series, near Bayreuth, Germany, and have been recently acquired for the Palæontological Series in the British Museum.

June 17, 1858.—The Lord Wrottesley, President, in the Chair.

"Description of some Remains of a Gigantic Land-Lizard (*Megalaniania prisca*, Ow.) from Australia." By Prof. Richard Owen, F.R.S.

The subject of this communication forms part of a collection of fossil remains from Australia, recently acquired by the British Mu-

seum, and demonstrates the former existence in that continent of a land-lizard considerably surpassing in bulk the largest species now known. The characters are chiefly derived from vertebræ, partially fossilized, equalling in size those of the largest existing Crocodiles; they are of the 'procelian' type, but present lacertian modifications, and closely agree with those in the great existing 'Lace-lizard' of Australia (*Hydrosaurus giganteus*, Gray), of which individuals upwards of six feet long have been taken. A generic or sub-generic distinction is indicated by the comparatively contracted area of the neural canal, and by the inferior development of the neural spine, of the fossil vertebræ, which have belonged to an individual not less than twenty feet in length, calculated from the vertebræ and proportions of the body of the existing *Hydrosauri*. For this, probably extinct lizard, the name of *Megalanian prisca* is proposed.

The results of an extended series of comparisons of its vertebræ with those of recent and extinct Sauria are also given.

"Researches on the Foraminifera. — Part III. On the Genera *Peneroplis*, *Operculina*, and *Amphistegina*." By W. B. Carpenter, M.D., F.R.S. &c.

In his preceding memoirs, the author has shown that two very dissimilar types of structure present themselves among Foraminifera, one characterized by its simplicity, the other by its complexity. In the former, of which *Orbitolites*, *Orbiculina*, and *Alveolina* are typical examples, the calcareous skeleton does not present any definite indications of organization, but seems to have been formed by the simple calcification of a portion of the homogeneous sarcode-body of the animal; that sarcode-body is but very imperfectly divided into segments, the communications between the cavities occupied by these segments being very free and irregular; the form of the segments themselves, and the mode of their connexion, are alike inconstant; and even the plan of growth, on which the character of the organism as a whole depends, though preserving a general uniformity, is by no means invariably maintained. In the latter, to which *Cycloclypeus* and *Heterostegina* belong, the calcareous skeleton is found to present a very definite and elaborate organization. The several segments of the body are so completely separated from each other, that they remain connected only by delicate threads of sarcode. Each segment thus isolated has its own proper calcareous envelope, which seems to be moulded (as it were) upon it; and this envelope or shell is perforated with minute parallel tubuli closely resembling those of dentine, except in the absence of bifurcation; the partition-walls between adjacent segments are consequently double, and are strengthened by an intermediate calcareous deposit, which is traversed by a system of inosculating passages that seems properly to belong to it. The form of the segments, their mode of communication, and consequently the general plan of growth, have a very considerable degree of constancy; and altogether the tendency is strongly manifested in this type to the greater individuali-

zation of the parts of the composite body, which in the preceding must be looked upon rather as constituting one aggregate whole.

In the present memoir this contrast is fully carried out by a detailed comparison of two characteristic examples from these types respectively, each of them having its own features of peculiar interest.

In *Peneroplis* we find, both as to the simplicity of the structure of the shell, and the general disposition of the segments of the animal, a close resemblance to the spiral forms of *Orbiculina*; the only difference being the absence of the transverse or secondary divisions of the chambers. In what is considered its typical form, the shell is a flattened spire, opening out widely in its last whorl; and the chambers communicate with each other (as does the last chamber with the exterior) by single rows of isolated pores disposed at regular intervals along the septa. But the spire is occasionally found to be more turgid, and the rows of apertures to become doubled; and instead of opening out in the last whorl, it is frequently prolonged in a rectilineal direction. In tropical seas there are found minute shells resembling those of *Peneroplis* in their very characteristic external markings, but having a very turgid spire, and having the row of pores in each septum replaced by a single large orifice with irregularly radiating prolongations. This type of structure has been characterized by M. d'Orbigny as a separate genus, under the name of *Dendritina*; and when its spire, as in many forms of *Peneroplis*, is continued rectilineally, it has been distinguished as a third genus under the name of *Spirolina*. The author shows, by an extensive comparison of individuals, that the single dendritic orifice is to be regarded as formed by the coalescence of separate pores; and that the extension of these into a single line, or their aggregation into a cluster, is related to the form of the septal plane, as determined by the degree of flattening or of turgescence of the spire. Consequently in his view *Dendritina* and *Spirolina* are but varieties of *Peneroplis*; the former, which are by far the largest and the most highly developed, being of tropical growth, whilst the most flattened forms of the latter are the comparatively stunted inhabitants of the Mediterranean and other seas of less elevated temperature.

In *Operculina*, on the other hand, we find the shell presenting the minutely tubular structure which was first shown by the author to exist in *Nummulites*; to which genus *Operculina* is so closely allied in structure, that the only positive difference between them seems to lie in the tendency of *Operculina* to open out widely in the last whorl, whilst *Nummulites* (according to MM. d'Archiac and Haime) tends to close in. The author minutely describes the structure of *Operculina*, which presents a very remarkable development of the canaliferous system; he also enters into a detailed inquiry into the relation of the numerous strongly-marked varieties of form which it presents,—a question of much importance in regard to the value of the characters of the reputed species among *Nummulites*; and shows that the range of individual variation in form and surface-

markings is so wide (as is proved by the gradational transitions which present themselves between what at first sight appear to be widely-separated types), that only where some very decided and constant difference of internal conformation presents itself, will it be safe to assume a specific diversity. In one case, in which he had thought that a certain series of specimens was sufficiently distinguished by its peculiar physiognomy from the rest, residual forms presented themselves which could not be with certainty assigned to either type, so completely do they link together the two by the softening down of the peculiarities of each. And a yet more remarkable link of connexion is established by examples collected on the coast of Japan by the American expedition to that country, in which the most distinctive characters of each type are curiously combined.

Closely related to *Operculina* is another genus, *Amphistegina*, which bears an equally near resemblance to *Nummulites*, though it has been completely separated from both in the classification of M. d'Orbigny, who has placed it in a distinct order, *Entomostegues*, on account of the unsymmetrical form of its shell and the alternating disposition of its chambers. But the author has found, from an extensive comparison of individuals, that this want of symmetry is so little constant, as to be altogether valueless in a systematic point of view, many specimens being perfectly symmetrical, whilst others are very far from being so, and every gradation presenting itself between these two extremes. The most common among existing species is the *Amphistegina gibbosa*, which is very extensively diffused through the tropical ocean, and which, though generally of small size, acquires in the Philippine region dimensions nearly equal to those of the fossil *Amphistegina* of the Vienna and other tertiary deposits. But Mr. Cuming's Philippine collection contains another and far larger species, which is distinguished by the extraordinary thinning-out of the last whorl; and it is remarkable that in this species the canal-system is highly developed, although completely absent in *A. gibbosa*,—a difference of structure, which, being associated with a very close resemblance in external aspect and general conformation, seems only to be accounted for on the supposition that the difference in size requires a difference in the arrangement of the nutrient apparatus.

ZOOLOGICAL SOCIETY.

March 9, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

PROPOSAL TO SEPARATE THE FAMILY OF SALAMANDRIDÆ, GRAY, INTO THREE FAMILIES, ACCORDING TO THE FORM OF THE SKULL. BY DR. J. E. GRAY, F.R.S., V.P.Z.S., PRES. ENT. SOC., ETC.

In the Catalogue of Amphibia in the British Museum I placed all the Salamanders which have teeth on the inner side of the hinder edge of the palatal bone together in a single family, under the name of *Salamandridæ*.

Having lately procured the skulls of several of the genera so united, and also examined M. Gervais' and M. Dugès' papers in the 'Annales des Sciences Naturelles,' in which the skulls of several other genera and species are figured, I am now induced to propose to divide the genera into three sections or families as follows.

In a group which offers so few permanent characters for the separation of the genera and species, and which presents such different varieties in the form of the dermal appendages, and in the colour of the body at different seasons of the year, one is very glad to seize on any part which appears to offer a permanent and tangible character.

Fam. I. SEIRANOTIDÆ.

Seiranotina, Gray, Cat. B. M. 1850, 29.

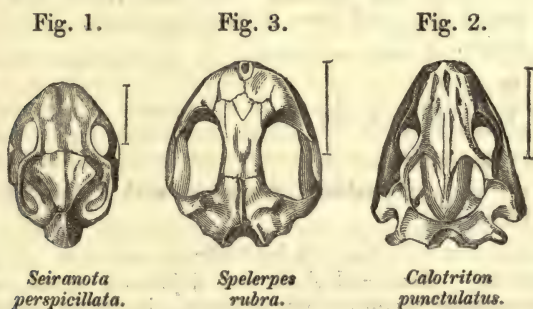
Skull very depressed, broad; the fronto-temporal arch distinct and united to the bones of the skull (figure 1). Tongue large, hinder half free. Body granular. Palatine bones with a longitudinal series of teeth forming two diverging series, angular in front. Ribs well developed. Vertebrae crested above. Limbs and feet well ossified. Toes 4·4.

1. SEIRANOTA.

Lateral line none. Skin closely and equally granular, granules oblong.

SEIRANOTA PERSPICILLATA (skull, fig. 1).

B.M.



Fam. II. PLEURODELIDÆ.

Skull depressed, broad, with a distinct fronto-temporal arch, formed by the union of a process of the frontal and temporal bone (fig. 2). Tongue moderate, attached; hinder and side edges scarcely free. Body granular. Palatine bone, with a longitudinal series of teeth forming two diverging series, angular in front. Ribs well developed. Vertebrae crested above. Limbs and feet well ossified. Toes 4·5.

- a. *Fronto-temporal arch complete. Lateral lines of pores distinct, low down between the axilla and groin.*

1. PLEURODELES.

Ribs exerted, forming a series of spines along the sides. Head and skull depressed, broad. Paratoids distinct.

1. P. WALTI.

Skull, *Erp. Gén. t. 101. f. 2.*

"*Bradybates ventricosus*, Tschudi, t. 2. f. 1, is perhaps the young."—*Duméril*. It only differs in the tail being short, perhaps injured.

2. GLOSSOLIGA.

Ribs enclosed. Head and skull very depressed. "Fronto-temporal arch with a separate central bone."—*Gervais*. Paratoid none; lateral pores small, single, in a continuous line.

1. GLOSSOLIGA POIRETI.

B.M.

Erp. Gén. t. 107. f. 1. Skull, *Gervais, Ann. Sci. Nat. 1853, xx. t. 15. f. 9, & Erp. Gén. t. 102. f. 5, 6.*

Forehead flat, with small scattered brown-tipped tubercles. Eyelids distinct, valvular.

N. Africa.

3. NOTOPHTHALMA.

Ribs enclosed. Head and skull rhombic. Forehead with two longitudinal ridges. Tongue oblong. Paratoids none. Cheek with three pits. Hind feet flattened. Tail compressed, keeled, often slightly finned above and below in breeding season.

N. America.

1. N. MINIATA.

B.M.

Skull, *Erp. Gén. ix. t. 107. f. 2.*

2. N. VIRIDESCENS.

B.M.

Vent in summer produced, truncated, with a rounded series of fringed filaments.

4. CYNOPS.

Tubercular. Head and skull very depressed, broad. Paratoid large, compressed; pores of lateral line small, distant, more distinct near the limbs. Fronto-temporal arch broad, distinct. Ribs enclosed.

1. C. PYRRHOGASTER.

B.M.

Skull, *Tschudi, t. 2. f. 5, cop. Schlegel, Fauna Japon. t. 5. f. 7, 8; Cat. Batrach. B.M. t. 3. f. 13.*

Japan.

5. TARICHA.

Tubercular. Head and skull depressed, broad. Paratoid large,

compressed. Pores of the lateral line small, indistinct, far apart. Vent small. Fronto-temporal arch broad. Skin with conical tubercles. Ribs enclosed.

1. TARICHA TOROSA.

B.M.

Skull, Esch. Zool. Atlas, t. 21. f. 15.
California.

b. *Fronto-temporal arch complete. Lateral line indistinct, marked with a vessel ; ribs enclosed.*

6. CALOTRITON.

Hemitriton, part., A. Dugès.

Head and skull rhombic. Eyelids distinct. Skin smooth, with small black-topped conical warts. Tongue oblong. Paratoids none. Toes free ; tips black, rather claw-like. Vent conical.

1. CALOTRITON PUNCTULATUS (skull, fig. 2).

B.M.

Hemitriton punctulatus, A. Dugès, Ann. Sci. Nat. xvii. 265. t. 113. f. 1, 2 ; skull, Dugès, *l. c.* f. 3 & 18.

Triton puncticulatus, Erp. Gén. ix. 152. t. 106. f. 3 ; skull, t. 102. f. 4.

7. EUPROCTUS.

Hemitriton, part., A. Dugès.

Head and skull rhombic, depressed. Tongue oblong. Paratoids none. Skin smooth, with scattered small rounded black conical warts. Cloaca produced, conic. Lateral lines of pores none.

1. EUPROCTUS RUSCONII.

B.M.

Hemitriton asper, skull, A. Dugès, Ann. Sci. Nat. xvii. t. 113. f. 21, 22.

H. cinereus, skull, Dugès, *l. c.* f. 14, 15 ; *H. rugosus*, skull, *l. c.* t. 1. f. 16, 17, and *H. Bibronii*, skull, t. 1. f. 19, 20, are evidently very nearly allied, if not all the same species.

8. LOPHINUS.

Body smooth. Palatine teeth in two separate series. Orbit in palate small. Fore toes slender, very unequal ; the hind toes broad, webbed on each side, the two inner conic. Back three-ridged. Crest of male continued. Lateral lines with distant single pores. Tail of male suddenly truncated before the apex, ending in a filament.

1. LOPHINUS PALMATUS.

B.M.

Selys-Longch. Faun. Belg. t. 5. f. 1, 2, good ; skull, Dugès, *l. c.* t. 1. f. 27, 28.

Triton, Wooley ; Baker & Deby, Zoologist, 1848, 2149, &c.

Triton minor, Higginbottom, Ann. & Mag. N. H. 1853, xii. 382. t. 16. f. 8, 9.

Lissotriton palmatus, Bell, British Reptiles, second edit. 1849, p. 154 (not of first edition).

"In the season of reproduction the tail of the male is suddenly truncated before the apex and terminated in a slender filament 3 lines in length. The hind feet perfectly palmated, all the toes united by a membrane (t. 16. f. 8). When the breeding season is over, the slender filament is absorbed, and the truncated portion of the tail becomes obtusely rounded off with a slight indurated dark tip at the end, and the web of the hind feet is wholly absorbed, leaving the toes free (t. 16. f. 9)." —*Higginbottom*.

Mr. Bell admits and figures this species in the second edition of his 'British Reptiles,' 1849, p. 154. The figure is not characteristic, as the crest of the male is not sufficiently high, and the coloration is differently disposed from any specimen which has come under my observation.

9. OMMATOTRITON.

Body smooth. Palatine teeth in a crowded series. Orbits in palate large, convex. Crest of male interrupted over the loins. Legs with a membrane on the inner edge. Hands with a subulate tubercle. The hind toes free, very slightly fringed with membranes. Lateral line of pores distinct, single.

1. OMMATOTRITON VITTATUS.

B.M.

Triton vittatus, skull, Dugès, l. c. t. 1. f. 29, 30.

England; North of France; Belgium.

Mr. Bell, in his 'British Reptiles,' gives a good figure of one of my specimens of this species, which he is convinced "is to be considered as a variety only of *Lissotriton palmipes*." The osteological character, as well as the form of the dorsal crest and the disposition of the colours, show that this is not the case, and that it is not only a distinct species but a very distinct genus, as is further proved by M. Dugès' figure of the skull.

c. *Fronto-temporal arch incomplete, ligamentous behind.*

10. PYRONICIA.

Hemisalamandra, *Hemitriton*, et *Triton*, part., Dugès.

Body slightly tubercular. Hinder toes fringed with a membrane. Back smoothish. Males with a crest. The skull with only a frontal process directed backwards and outwards, the temporal apophysis in the other genera being replaced by a tendinous cord.

1. PYRONICIA MARMORATA.

B.M.

Skull, *Erp. Gén.* t. 106. f. 1.

Hemisalamandra marmorata, Dugès, *Ann. Sci. Nat.* xvii. t. 1. f. 10, 11.

Back marbled, vertebral line pale. Pores of the lateral line distinct, in pairs. Skin smooth, punctulate, subtuberculous.

Oporto.

2. PYRONICIA PUNCTATA.

Triton punctatus, Dugès, l.c. t. 1. f. 25, 26; Bell, Brit. Rept. ed. 2.

Triton lævis, Higginbottom, Ann. & Mag. N. H. xii. 380. t. 16. f. 6, 7.

Lissotriton punctatus and *L. palmatus*, Bell, Brit. Rept. ed. 1, 1839 (not Latr.).

Pupils circular, rather larger than those of *T. cristatus*.

The figures of the Smooth Newts (*Lissotriton*) in Mr. Bell's 'British Reptiles' (1839) are so destitute of character, that it is impossible to refer them to the known species with certainty. The figures of *L. punctatus* at pp. 132 and 135, appear to be that species in its winter state; and the figures of *L. palmipes* at p. 139 appear to be intended for the same species in summer, if we regard the disposition of the spots, and the height of the dorsal fin: but the fin is not dentated, as it always is in that species, and the toes are not proper for it in its crested state; at the same time it bears no resemblance to the true *T. palmatus*, which has an entire crest; nor has it the filament at the end of the tail, which is always found in the crested form of that species.

In the second edition (1849), Mr. Bell has referred all these figures to *Lissotriton punctatus*, and places the figure which he formerly called *L. palmatus* at the head of the species, p. 143; but it is not characteristic of it, as wanting the dentation on the crest and the broad rounded end fringe of the toes, which are so characteristic of the crested state of the species.

Mr. Bell, believing that the form of the upper lip afforded a good character for the distinction of the species of these animals, divides them into two species, thus—"1. *Lissotriton punctatus*, upper lip straight, not overhanging the lower (p. 132, 138, fig. 2). *Lissotriton palmipes*, upper lip pendulous at the sides, overhanging the under in a distinct festoon as far as the base of the lower jaw. Toes of hinder feet fringed with a short membrane at all seasons." I may observe that the latter is not the *T. palmipes* of Latreille, which has the hind feet of the male in the breeding-season webbed; and that I believe it only differs from the former by being in the fully-developed state at the season of reproduction; and I am borne out in this idea by the observations of Messrs. Higginbottom, Hogg, and many others.

The former observes: "Some *Tritons* have been distinguished by the upper lip overhanging the lower. I have observed that in the first year of *Triton asper* the upper lip overhangs the under considerably at the sides; in the second it overhangs less; between the second and third year it becomes straighter, and in the fourth it overhangs again as much as in the first year. This is also very evident in the *Triton lævis*, in which the same changes take place."—*Ann. & Mag. N. H.* 1853, xii. 375.

"Neither kind of *Triton* is found in the water during the winter months; but they (the brick-makers) discovered great numbers of them in holes in the clay, and sometimes ten or twelve coiled to-

gether. I have observed that either a very wet or very dry situation is fatal to the *Triton* during its state of hibernation, and that a moderately damp one is always chosen for that state of existence ; and further, that the *Triton* can live in a solid mass of ice without injury.

“About the last week in March the perfect *Triton* leaves the land and becomes aquatic. It has then acquired all those appearances which exist only during the breeding-season. They are absorbed rather rapidly, and the animal leaves the water in August.

“The *Tritons* of the third and fourth year are found during the cold season in the earth under stones, in clusters of the magnitude of a cricket-ball ; those of an earlier period are often found singly at a greater depth under the earth, as before stated.”—p. 381.

11. HEMITRITON.

Body tubercular. Males with a slightly-produced vent. Lateral line none.

1. HEMITRITON ALPESTRIS.

B.M.

Hemitriton alpestris, Dugès, l. c. t. 1. f. 23, 24 ; Fauna Ital. t. 8. f. 2.

Fam. III. SALAMANDRIDÆ.

The skull narrow, without any dilatation of the frontal or temporal bone to form a fronto-temporal arch. Palate with a longitudinal series of teeth, arched in front. Tongue moderate, attached, hinder and side edges scarcely free. Body granular. Vertebræ rounded. Ribs and bones of limbs and feet imperfectly ossified. Paratoids large, glandular.

* *Lateral lines of pores high up the back, elevated, wart-like.*

1. SALAMANDRA.

Palatine teeth extending before the internal nostrils. Tail roundish. Back not crested.

1. SALAMANDRA ATRA.

B.M.

Skull ; Dugès, l. c. t. 1. f. 8, 9.

2. SALAMANDRA MACULOSA.

B.M.

Skull, Dugès, l. c. t. 1. f. 6, 7.

3. SALAMANDRA CORSICA.

Mouth, Bonap. Fauna Ital. ii. t. 53 (cop. Dugès, l. c. t. 1. f. 4, 5).

** *Lateral line of pores on lower part of side between axilla and groin.*

2. TRITON.

Granular. Tail compressed. Back of male crested. Toes free, simple.

1. TRITON CRISTATUS. B.M.

Hemisalamandra cristata, skull, Dugès, *l. c.* t. 1. f. 12, 13 (Erp. Gén. ix. t. 102. f. 2, 3, not sufficiently broad for our specimens).

Triton marmoratus, Bibron, Proc. Zool. Soc. 1838, 23 (not Latr.).

Triton cristatus & *T. Bibronii*, Bell, Brit. Rept. pp. 129, 131, figs.

Pupil small, circular. Tail with a broad pale-bluish longitudinal streak rather below the centre.

M. Bibron, when in London, on observing a specimen of the Warty Newt with straight lips, in the Collection of the Zoological Society, named it *Triton marmoratus*, probably thinking that it was *Triton marmoratus* of Latreille, a species of the South of Europe.

Mr. Bell, in his work on British Reptiles, figures the specimen, and gives it the name of *Triton Bibronii* (pp. 129 & 131, figs.), observing, "it is the same as *Tr. cristatus*, excepting that the upper lip is perfectly straight."

After examining various specimens in different states, I am convinced that the form of the lip depends on the season, the male in the breeding-season having the most overlapping lip.

The same change in the form of the lip in the different seasons is to be observed in *Lissotriton punctatus*.

Mr. J. Higginbottom observes: "The two species of *Triton* (found in the Midland Counties) present such varied appearances during the three years of their slow but progressive growth, and during the changes they experience preparatory to their return from being inhabitants of the land, breathing atmospheric air, active in the summer and hibernant in the winter, to being denizens of the water, reproducing their kind in the months of March, April, May, June and July, that I think they have been regarded by naturalists as presenting too great a number of distinct species."—*Ann. & Mag. N. H.* 1853, xii. 370.

The skulls and skeletons of all the genera of *Molgidae*, *Plethodontidae*, *Protonopsidae* and *Amphiumidae* I have been able to examine, or which are figured in any works that have occurred to me, resemble those of the family *Salamandridae*.

Considering the very important characters which the examination of the skulls has shown them to possess for the distinction of the European and Japanese species, it is very desirable that the American species should be carefully examined for the same purpose. Up to this time even the description of the palatine teeth of the American species is involved in great uncertainty, the descriptions of Harlan, Holbrook and Baird being often at issue on this important point. It is but just to observe, that when I have had the opportunity of

comparison, I have generally found the descriptions of Dr. Baird the most accurate and trustworthy.

To facilitate this object, I have added a list of the species the skulls of which have been figured.

Fam. MOLGIDÆ.

MOLGE STRIATA, Gray, Cat. Batr. p. 31. t. 3. f. 111; Schlegel, Fauna Japon. t. 5. f. 9, 10.

Fam. PLETHODONTIDÆ.

ONYCHODACTYLUS JAPONICUS, Gray, Cat. Batr. p. 33. t. 3. f. 1; Fauna Japon. t. 3. f. 6.

AMBYOSTOMA OPACUM, Dum. et Bibr. Erp. Gén. ix. t. 10. f. 6.

PLETHODON GLUTINOSUM, Tschudi, Batr. t. 2. f. 4.

DESMOGNATHUS FUSCUS.

Plethodon fuscum, Dum. et Bibr. Erp. Gén. t. 101. f. 3. B.M.

SPELERPES RUBRA (skull, fig. 3, p. 293).

"*Bolitoglossa rubra*, Cab. B.M." from Paris.

GEOTRITON FUSCUS, sp., Dum. et Bibr. E. G. ix. 112. t. 102. f. 1.

ÆDIPUS VARIEGATUS.

Bolitoglossa mexicana, Dum. et Bibr. Erp. Gén. ix. p. 3. t. 101. f. 4.

ENSATINA ESCHSCHOLTZII, Esch. Zool. Atlas, t. 22.

March 23, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

DESCRIPTION OF A NEW GENUS OF BOIDÆ FROM OLD CALABAR. BY DR. J. E. GRAY, F.R.S., V.P.Z.S., ETC.

Mr. Logan has kindly sent to me for examination a number of Snakes and other reptiles which had been collected by the missionaries in Old Calabar.

Among several very interesting species I observed a new genus of the family *Boidæ*, which I have great pleasure in laying before the Society, more especially as it appears to be the indication of a new tribe in that curious family.

This animal belongs to the second section of the family, which is thus characterized :—

- ii. *Tail very short, not, or only very slightly, prehensile. Head indistinct, short.*

It is entirely distinct from the tribes *Cylindrophina*, *Carinina*, and *Tortricina*, and therefore I propose to form for it a tribe (*Calabariina*) by itself, having the same characters as the genus.

CALABARIA.

Head small, short, rounded in front, the same size as the body. Muzzle depressed, rounded; labial shields flat, $\frac{8-8}{9-9}$; the hinder small, front moderate; rostral shield high, large, triangular; frontal shields three pairs, band-like, subsimilar, followed by a band-like shield continued from side to side, which has behind it a small sub-trigonal shield on each side, with a central large triangular shield between them on the crown. Eyes surrounded by scales on the upper edges of the upper labial shields and the outer edges of the fourth and fifth frontal plates, and with one ocular shield in front and two smaller behind the eyes; loreal shield single, small. Pupil circular. Nostril lateral, between two small nasal shields. Body cylindrical. Scales broad, triangular, polished, rather sunken and subrugose in the centre. Ventral shields very numerous, band-like, transverse, about half as wide as the diameter of the body. Vent small, with a single preanal shield. Spurs large, distinct. Tail short, as thick as the body, blunt and rounded at the end. Subcaudal shields broad, band-like, one-rowed like the ventral shields.

I think it is probable, when some other specimens have been examined, that the band-like shield extending across from the upper edge of each eye will be found to be composed of three shields, like the band behind it, which are here united into one band; and then the head-shields will lie thus:—three pairs of band-like frontal, two smaller triangular superciliary shields over each eye, having in the middle between them two triangular parietal shields.

CALABARIA FUSCA.

Dark brown, some of the scales yellowish, scattered singly or in groups on the back and sides; ventral shields greyish; sides of the belly with a few unequal yellow spots.

Length 36 inches, diameter 1 inch.

Hab. Old Calabar, W. Africa (*W. Logan, Esq.*).

Since this paper was read, I have discovered a young specimen of this Boa among the specimens obtained from the Zoological Society, which they had received from Fernando Po. It is about half the length and diameter of the specimen from Old Calabar. It has the head-shields more uniform, and as I supposed they might be when I described that specimen.

It has three pairs of band-like frontal shields over the forehead, a rather large parietal shield behind them on the crown of the head, and two small subequal superciliary shields between the outer edge of the parietal and the eye, on each side a narrow transverse band-like central shield behind, and rather broader than, the parietal shield, with a small scale-like shield, like those on the neck, behind and on the sides of it.

ON NEMOPHIS, A NEW GENUS OF RIBAND-SHAPED FISHES.

BY DR. J. KAUP.

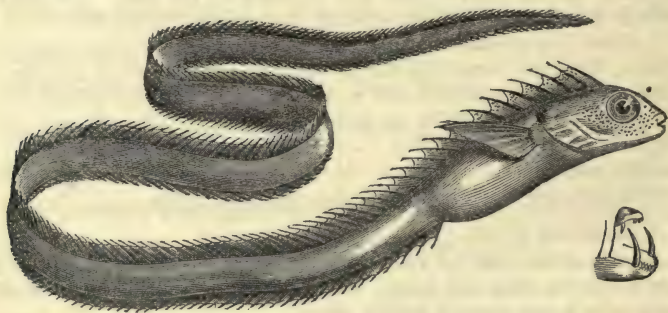
In the collection at the Museum of Natural History in Paris I
Ann. & Mag. N. Hist. Ser. 3. Vol. ii.

found, some years ago, when I was describing the order of Eels, this interesting genus, in which the form and function of the canine teeth are extremely remarkable.

Two specimens of this rare fish were received at the Museum, from MM. Lesson and Garnot, without any note: as they were obtained in the expedition of M. Duperrey, I presume they were captured in the South Sea.

One of the specimens being in a half-spoiled condition, I was enabled, but in this specimen only, to observe the paradoxical arrangement and formation of the canine teeth.

From the smallness of the mouth, no one would have expected to find at the end of the small incisors such large slightly-curved canine teeth in the lower jaw. These canine teeth pass through a canal in the flesh round the eye, and have an opening near the eye. These teeth, which cannot be used as true canine teeth on account of the smallness of the mouth, have certainly only the function of fixing and giving the lower jaw a certain direction.



I call this paradoxical form

NEMOPHIS.

Without ventral fins. Mouth small; upper and lower jaw with minute incisors. Small canine teeth in the upper jaw, longer and curved ones in the lower jaw, which are placed, when the mouth is closed, in a canal going round the eyes and opened on the surface near the eyes. Eyes large. Cavity of the gills with a small round opening placed very high. The dorsal fin commences near the eyes, and is connected with the caudal and anal as in the Eels. Pectoral fin developed. Anus at the end of the first eighth of the total length.

NEMOPHIS LESSONI, Kp.

It has a length of 255 mm. or 9 Par. inches. Colour silver-white, with black points on the head and end of the tail. Dorsal and anal fins blackish.

Diameter of the eye 5, length of the head to the gill-opening 15, from the muzzle to the anus 32 millimetres.

This genus forms a distinct group among the Riband-shaped Fishes, and is perhaps the type of a different family, which we may call *Nemophidæ*.

April 13, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

ON THE SNIPE'S "NEIGHING" OR HUMMING NOISE, AND ON ITS TAIL-FEATHERS' SYSTEMATIC VALUE. BY W. MEVES, OF STOCKHOLM. TRANSLATED AND COMMUNICATED BY JOHN WOLLEY, JUN., ESQ., F.Z.S.

On the origin of the neighing sound which accompanies the Common Snipe's (*Scolopax gallinago*, L.) play—flight during pairing time—opinions are various. Bechstein thought that it was produced by means of the beak; Naumann and others, again, that it originated in powerful strokes of the wing: but since Pralle* in Hanover observed that the bird makes heard its well-known song or cry, which he expresses with the words "gick jack, gick jack!", at the same time with the neighing sound, it seemed to be settled that the latter is not produced through the throat. In the meantime I have remarked with surprise, that the humming sound could never be observed whilst the bird was flying upwards, at which time the tail is closed; but only when it was casting itself downwards in a slanting direction, with the tail strongly spread out.

The peculiar form of the tail-feathers in some foreign species nearly allied to our Snipe (for example, *S. javensis*) encouraged the notion, that the tail, if not alone, at all events in a considerable degree, conducted to the production of the sound. On a closer examination of the tail-feathers of our common species, I found the first (outer) feather, especially, very peculiarly constructed; the shaft, uncommonly stiff, sabre-shaped; the rays of the web strongly bound together and very long, the longest reaching nearly three-fourths of the whole length of the web, these rays lying along (or spanning from end to end of the curve of) the shaft, like the strings of a musical instrument (fig. 1). On blowing from the outer side upon the broad web it comes into vibration, and a sound is heard, which, though fainter, very closely resembles the well-known neighing.

But to prove clearly that it is the first feather which produces the peculiar sound, it is only necessary carefully to pluck out such a one, to fasten its shaft with fine thread to a piece of steel wire a tenth of an inch in diameter and a foot long, and then to fix this at the end of a 4-foot stick. If now the feather be drawn, with its outer side forward, sharply through the air, at the same time making some short movements or shakings of the arm so as to represent the shivering motion of the wings during flight, the neighing sound is produced with the most astonishing exactness.

If we wish to hear the humming of both feathers at once, as must be the case from the flying bird, this also can be managed by a simple contrivance. Taking a small stick, and fastening at the

* Naumannia.

side of the smaller end a piece of annealed steel wire in the form of a fork, a side tail-feather is bound to each point, and the wire is bent so that the feathers receive the same direction which they do in the spreading of the tail as the bird sinks itself in flight ; with this apparatus the feathers are drawn through the air, as before.

Such a sound, but in another tone, is produced when we experiment with the tail-feathers of other kinds of Snipe. But in *S. major*, *capensis*, and *frenata* four humming-feathers (*surr pennor*) are found on each side, which are considerably shorter than in the species we have been speaking of. *Scolopax javensis* has eight on each side, which are extremely narrow and very stiff.

Since in both sexes these feathers have the same form, it is clear that both can produce the humming noise ; and by means of experiment I have convinced myself that it is so. But as the feathers of the hen are generally less than those of the cock bird, the noise also made by them is not so deep as in the other case. Professor Nilsson announces, that in the female of the Single Snipe a neighing noise has been already observed.

It would be interesting if travelling ornithologists would in future make observations on the foreign species in a state of nature. It ought to be found that these also have a neighing or humming noise, but differing considerably from that of our species.

Besides the significance which these tail-feathers have as a kind of musical instrument, their form may give a very weighty character in the determination of species standing very near one another, which have been looked upon as varieties.

To call attention to this subject, I have caused to be drawn the tail-feathers of several species. They are the following :—

Fig. 1. *Scolopax (Telmatias, Boie) gallinago*, L.

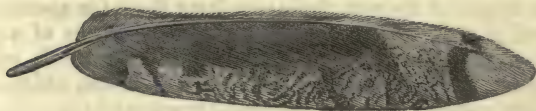


Fig. 2. *Scolopax (Telmatias) capensis*.

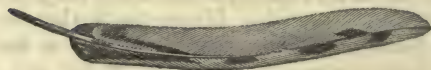
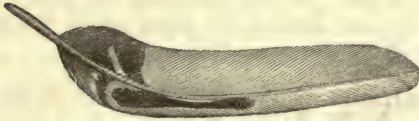


Fig. 3. *Scolopax (Telmatias) frenata*, Illig.



Fig. 4. *Scolopax (Telmatias) javensis*.Fig. 5. *Scolopax (Telmatias) major*, L.Fig. 6. *Scolopax (Philolimnos, Brehm) gallinula*, L.

The structure of the tail-feathers in the last-named species differs considerably from that of the others; it gives upon experiment no humming sound; and all the feathers of the tail are, as in *Scolopax rusticola*, formed pretty much like one another.

If it be considered desirable to divide the Linnæan genus *Scolopax* into subgenera, I should propose to class those together which have musical feathers in the tail, under the name *Odura*.

The interesting discovery recorded in the above paper was first announced by M. Meves in an account of the birds observed by himself during a visit to the island of Gottland in the summer of the year 1856, which account appeared in a publication of the Vetenskaps Akademi at Stockholm the following winter.

In the succeeding summer M. Meves kindly showed me his experiments. The mysterious noise of the wilderness was reproduced in a little room in the middle of Stockholm. First the deep bleat now shown to proceed from the male Snipe, and then the fainter bleat of the female, both most strikingly true to nature, neither producible with any other feathers than the outer ones of the tail.

I could not resist asking M. Meves the impertinent question, how, issuing forth from the town for a summer ramble, he came to discover what all the field-naturalists and sportsmen of England and other countries had, for the last century at least, been in vain trying to make out, straining their eyes, and puzzling their wits? He freely explained to me how, in a number of 'Naumannia,' an accidental misprint of the word representing tail-feathers instead of wing-fea-

thers—a mistake which another author took seriously, and ridiculed—first led him to think on the subject. He subsequently examined in the Museum the tail-feathers of various species of Snipe, remarked their structure, and reasoned upon it. Then he blew upon them, and fixed them on levers that he might wave them with greater force through the air; and at the same time he made more careful observations than he had before done of the living birds in the breeding season. In short, in him the obscure hint was thrown upon fruitful ground, whilst in a hundred other minds it had failed to come to life. At my invitation, M. Meves wrote for the Zoological Society of London the paper which I have here translated.—JOHN WOLLEY, April 1858.

DESCRIPTION OF TWO NEW SPECIES OF ENTOZOA.

By W. BAIRD, M.D., F.L.S., ETC.

In 1821 Nitzsch established a new genus of Nematoid Worms in Ersch and Gruber's Encyclopædia. This genus he named *Hedruris*, from the two Greek words *ἔδρα*, seat, and *οὐρά*, tail,—a name by which he intended to indicate the peculiar manner in which the female is attached to the stomach of the animal in which it was found. As yet there has been only one species described, *Hedruris androphora*, which was first discovered in the stomach of the fresh-water Newts, *Triton cristatus* and *Lissotriton punctatus*. The female is distinguished by having the caudal extremity swollen and terminated by a suckorial apparatus, by means of which, and with the assistance of a horny claw like the claw of a cat, it adheres firmly to the coat of the stomach of its host. The tail of the male terminates in a sharp curved point, provided with five or six papillæ disposed in a longitudinal series along the under surface. It is always found spirally twisted round the body of the female, and it is no doubt by means of these suckorial papillæ that it keeps itself attached to the female. Dujardin, in his 'Hist. Nat. des Helminthes,' hesitates where to place this genus, and arranges it in an Appendix along with several others, the true position of which he had not satisfactorily ascertained. Diesing, in his 'Systema Helminthum,' places it in the same section with, and immediately following, the genus *Ascaris*, and considers, like Nitzsch, that the species *androphora* is identical with the *Ascaris leptocephala* of Rudolphi. In the Collection of Entozoa in the British Museum are several specimens of a small Nematoid Worm, sent under the name of *Ascaris leptocephala* to the National Collection by M. Siebold. If these are correctly named by this last-mentioned naturalist, the species *Asc. leptocephala* is a true *Ascaris*, and quite distinct from the species from which Nitzsch formed the genus *Hedruris*, a very good figure of which may be seen in the 'Allgemeine Encyclopädie' of Ersch and Gruber, vol. vi. p. 48.

A short time ago I received, through the kind attention of Sir W. Jardine, a specimen of an Entozoon which he took from the abdominal cavity of an Amphibian which has rarely found its way to this country, the *Siredon mexicanus*. Upon examination I ascertained

it to be a female of a new species of this rare genus *Hedruris*. In size it is about four times longer than the *androphora*; it has a larger head, and the body more distinctly striated across. This species I have named *Hedruris Siredonis*; but as only the female has been as yet discovered, I am unable to give a very detailed description of it.

HEDRURIS SIREDONIS.

Female. Body 13 millimetres long, $\frac{1}{2}$ millimetre broad, strongly striated across, narrower at the anterior than the posterior extremity, this latter terminating in an obtuse point furnished with what Diesing calls a suctorial papilla, by which it adhered to the coat of the stomach of the *Siredon*. *Male* — ?

Hab. Stomach of the *Siredon mexicanus* from Mexico. British Museum Collection.

Along with this interesting species, and in the abdominal cavity of the same animal, were three specimens of another Nematoid Worm of a very different form. I consider it to belong to the family *Strongylidæ*, and to a genus which Dujardin established under the name of *Leptodera*, so called from the long narrow neck (*λεπτός*, narrow, *δέρη*, neck) which distinguishes the species upon which the genus was founded. Only one species of this genus has as yet been described,—the *Leptodera flexilis* of Dujardin, which was found parasitic in the vas deferens of one of the Common Slugs (*Limax cinereus*). This species is only from $2\frac{1}{2}$ millimetres (male) to 4 mill. (female) in length, whilst the new species from the *Siredon* measures from 16 to 25 mill.

LEPTODERA ELONGATA.

Female. 25 millimetres long. Body filiform, neck long and slender; tail terminating in a long sharp point. Vulva situated about the middle of the length of the body.

Male. 16 millimetres long. Body filiform, neck long and slender, tail sharp-pointed. Spicula double, proceeding from a swelling near the commencement of the tail, and accompanied by two short membranous expansions like wings.

Hab. Abdominal cavity of *Siredon mexicanus*. B.M. Collection.

MISCELLANEOUS.

On the Flowering of the American Aloe. By W. SOWERBY.

To the Editors of the Annals of Natural History.

GENTLEMEN, Botanic Gardens, Regent's Park, Sept. 20, 1858.

As the American Aloe (*Agave Americana*), although a very common plant, is seldom seen in flower, at least in England, perhaps a few notes on the growth, &c., of the one now in bloom in these Gardens may interest some of the readers of the 'Annals.'

The familiar fable of the "plant that only flowers once in a hundred years" has originated, no doubt, from the fact that some of the specimens that have produced flowers in England may have seen the years of a century, while many die without flowering before they attain that age; but this is quite the exception to the natural habit of the plant, which in its native country (South America) sometimes flowers at the age of eight, or even five years, the average being about ten. Loudon mentions a specimen that flowered in Devonshire at the age of twenty years, and another in Cornwall fifty-six years old: both of these were grown in the open air; and he thinks that the *Agave*, if grown under the same treatment as a Pine-apple, would no doubt flower as soon, or in about four or five years. I have known some plants of American Aloe, when well cultivated, increase more in two years than other neglected or starved individuals in ten. Not only Aloes, but many other plants, especially succulents, when exposed to cold and allowed very little nourishment, remain for years in an almost stationary position with regard to growth, although alive. The Chinese take advantage of this fact in producing their pigmy trees.

In Mexico, Spain, Sicily, and various parts of India, the *Agave* is largely cultivated, not so much as an ornament as for its valuable commercial products. 'Pulque,' the national beverage of the native Mexicans, is prepared from the sap, which flows in great abundance from the flower-stem, which is cut off for this purpose as soon as it appears, from among the leaves, the supply being about seven or eight quarts per day. The ligneous fibre called 'Pita'-thread is also very valuable, especially for ropes and cordage, and exceedingly strong. Roofs of houses are often covered with the leaves, in place of tiles or thatch. The plants set in rows make excellent and impenetrable fences; and in Jamaica the expressed juice of the leaves, when evaporated, has served as a substitute for soap.

In the year 1839, a specimen of *Agave Americana* flowered in these Gardens, being one of three plants the property of a gentleman at Highgate, who stated that they had been in the possession of his family for seventy-five years, and also that the plants were twenty or twenty-five years old when they first obtained them. In 1841 the Society purchased the two remaining plants, they being about the same size as the one that flowered: one of these threw up a flower-spike in June 1845, in a greenhouse; and now, thirteen years later, the last remaining of these old friends is finishing its long and dreary life, at the age of 115 or 120 years. It has scarcely increased in size for the last ten years, and has probably been waiting since 1848 for some slight alteration in its treatment to induce it to flower. Early in May the plant was removed from the conservatory to a sheltered nook in the open garden, and permitted to enjoy the influence of sunshine and genial showers; on the 12th of June the flower-spike first made its appearance, the average growth for a few weeks being about 3 inches in 24 hours, the daily register varying from 1 to 10 inches, according to the temperature and state of the weather; the rate of increase gradually became less till the 28th of August, when the up-

ward growth of the spike terminated, it having reached exactly 24 feet. Some time before this, the scape began to throw out its lateral branches; these extend 6 inches to 2 feet from the main stem, to the number of forty-six, and branch out from all sides in graceful curves in the form of a candelabrum, which, indeed, the whole plant much resembles; at the extremities of these laterals are seated three to seven bunches of from twelve to fifty flowers, the total number of flowers being about 3500. The first bud expanded on the 8th of September, since which a great number have rapidly opened. It is scarcely correct to make use of the term opened; for the corolla does not expand. The stamens and style being protruded from among the upper points of the petals, and having a bright yellow colour, give a somewhat gay and light appearance to the plant, the petals themselves being of a yellowish-green hue. Some few months before the scape made its appearance, the leaves began to wither; and as the flower-spike rapidly increased, in the same ratio the leaves decayed and shrivelled, the juices they contained having evidently been stored up for the express purpose of supplying the nourishment required by the flower; and only by this means could the large amount of vegetable matter contained in the flower-scape have been collected in so short a time, as the roots of the plant are very inconsiderable. The whole plant dies immediately it has perfected its flowers, so that it can only flower "once" in its lifetime, be this ten or a hundred years.

Believe me, Gentlemen,

Yours sincerely,

W. SOWERBY.

On a variety of Chorda filum. By Dr. J. E. GRAY, F.R.S. &c.

The base and apex of *Chorda filum* (Sea-traces) are usually attenuated and acute. Mrs. Gray observed, in the specimens growing in Swanage Bay, that some individual fronds of a group from the same root had the apex largely dilated into a broad, ovate, hollow club, with a few minute, compressed, transparent spines near the more or less blunt top of the club. This club, which is often 4 or 5 inches long and an inch in diameter, is formed by a dilatation of the frond; and, like the usual state of the frond, it easily divides across and separates into a spiral band, as the common form of the frond is represented as becoming unrolled in fig. 3 of pl. 107 of Dr. Harvey's 'Phycologia Britannica,' and as described and figured by Dr. Greville, 'Algæ Britannicæ,' p. 48. t. 7. f. 2.

I do not recollect having observed this variety noticed in any work on British Algæ, which is the more remarkable, as the club, bobbing up and down on the surface of the sea like an angler's float, makes a very conspicuous object in the smooth water of that beautiful bay. I find it is noticed in Lyngbye's work on the Algæ of Denmark as "*Chorda filum* β . *inflata fronde simplicissima majori apice inflata*," p. 73 (1810), found in the "Sinu Otheniensi;" and he states that it is also described as a *Ceramium* by Roth, 1797; see Cat. Bot. i. 174.

This variety is not noticed by Agardh in his 'Synopsis Algarum Scandinaviæ,' p. 13, where he describes the frond as "e fibris spiralliter tortis constructæ," nor in his 'Species Algarum,' p. 161, nor in any other work I have at hand.

Swanage, Sept. 1858.

On the Influence of the Moon's Light upon Plants.

By Prof. ZANTEDESCHI.

The Abbé Tessier having made a great number of experiments upon etiolated plants, which had become white or yellow from being kept in the dark, observed that those exposed to the light of the moon, and kept in the dark during the day, were evidently less yellow or white than those kept in the dark day and night. (Acad. des Sc. de Paris, 1781; Bertholin, 1783; Giuseppe Toaldo, Vincenza Padova, 1797.)

The Abbé Antonio-Maria Vassalli, Professor of Physics at Turin, relates that the Sensitive-plant is susceptible of the influence of moonlight. "Having," he says, "procured some sprouted seeds of the Sensitive-plant, twelve days after their germination I transplanted them into earth contained in glass bottles, and into other vessels filled with earth.

"I observed that their sleep had a regular periodicity. Exposed to the east two hours before sunrise, their leaves, which were perfectly closed at 1 A.M., began to open at dawn, and unfolded completely some little time after sunrise, more or less quickly according to the state of the air. If they are carried during the day into a dark place, or covered with an opaque vessel, the leaves close, but not so exactly as during the night. Exposed afresh to the light, they open again slowly. In making these observations I was careful to shake all the pots equally, without covering them, in carrying them, in order that the variations might not be attributed to these shocks. After repeating the various observations, for greater certainty, I exposed the pots to the light of the moon.

"I did not remark any variation in the leaves when the exposure, commencing at 1 A.M., had lasted one hour; but after three hours the leaves were less closed, though still not open.

"Having one evening exposed the pots to the rays of the moon until midnight, when the leaves were not completely closed, I found them very well opened about 1 A.M.

"I attempted to arrange a lens so that its focus should fall on a closed leaf; but I could not detect any variation in the short space of time during which the light of the moon was condensed." (Opuscoli scelti di Milano, 1794.)

These observations have been renewed in our own time on vetches, by Prof. G. Giulj: he caused vetches to germinate and spring up in a cellar entirely shut up from the light both of the sun and moon; and the little plants were very white. Some of them were exposed for several nights to the action of the moon's rays, while others, also in full growth, were kept in complete darkness: the former acquired a

green colour like that of the same plants exposed in the open air, and even to the sunlight; those, on the contrary, kept constantly protected from the light of the sun and moon were not at all coloured, and ultimately rotted. More than this: Prof. Giulj ascertained by direct experiment that the light of the moon falling upon certain plants, or certain leaves, has the property of causing the liberation of oxygen (*Dei Lavori della Reale Accadem. delle Scienze*, 1844).

I have successfully repeated the experiments of Tessier and Giulj on the power possessed by the rays of the moon in developing the colours of the leaves of plants, and I took the greatest precautions to maintain the pots in all the conditions which were necessary to avoid the objections which might be founded upon the influence of humidity or any other atmospheric variation. They were kept in the dark during the whole day; when the days preceding the full moon arrived, they were carried, after 3 A.M., always to the same place to be exposed to its rays: but two of the pots were uncovered, and two protected from the rays by an opaque body; the others were freely exposed to the open air and all its influence.

After six nights' exposure, the difference in the coloration was very marked: the little plants constantly protected from the influence of light were white; and those exposed to the lunar rays had a yellowish tint, which appeared to be changing to the green colour.

I desired to repeat also the experiment of Vassalli. I have only made observations upon leaves perfectly closed, and little shoots, of no vigour, drooping over the edges of the pots wherein they had germinated. After that, I tried exposing various specimens of *Mimosa pudica* to the action of the moon's rays for an hour during full moon. I was delighted to see the little shoots rise after a quarter of an hour's exposure; the plants were at the distance of a few millimetres from the edge of the pot; in half an hour the stems were still straighter, and in an hour and a half they had attained the height of more than 2 inches; but I could not detect any sensible opening of the leaves. This experiment appeared necessary in order to confirm what has been said of the influence of the rays of the moon upon the growth of the *Mimosa*, because this fact, more or less established by Vassalli, has not been received with entire confidence by other authors; and in this last experiment I took the precaution of placing near the *Mimosa* exposed to the lunar rays another of the same plants covered with an opaque body, which shielded it from the light: in this no movement was produced. The experiment was repeated six times with constant results. We may therefore believe that the growth of the little stems of the *Mimosa* is to be attributed solely to the influence of the moon's rays.

I made these experiments in the summer of 1847; and I have thought it necessary to enter into details, because I was able to make certain, by a great number of observations, frequently repeated, that the difference of temperature, of the movement of the air, and exposures to different degrees of light, had an influence upon the more or less prompt and more or less perfect manner in which the leaves of the *Mimosa* open and close.

One morning in the month of July, about 5 o'clock, in the Botanic Garden of Venice, two plants of *Mimosa pudica*, kept in a conservatory (perfectly expanded), presented an aspect of luxuriant vegetation. Another, exposed in the open air, had its leaves entirely closed and the stems bent. A fourth, placed in another part of the garden, was half-closed; and another, in a separate place, was quite closed. On the day preceding, the gardener had, at my orders, shut up the last in a dark place three hours before sunrise.

I took care also to verify the influence exerted upon the *Mimosa* by the artificial light of a lamp, and I found the growth was from 3 to 5 centimetres.—*La Lumière*, July 17, 1858.

General Examination of the Group Euphorbiaceæ.

By M. H. BAILLON.

The great number of facts met with in the study of about fifteen hundred species, cultivated at Paris or preserved in the collections, have compelled the author to divide into two series his 'Étude générale du groupe des Euphorbiacées.' In the first part he combines the matters relating to the search for types, the natural affinities, classification, descriptions of genera, and organography, based as far as possible upon organogenic studies.

It is only in the adult state that the existence of compound leaves can be regarded as exceptional in this order. Very frequently they are compound at their first appearance; but the terminal lobe only becomes developed, the lateral being abortive. They then become lamellæ of variable form, and very often true glands, which occupy the base of the blade. It is simply by such an arrest of development that a *Cremophyllum* differs from a *Dalechampia*; but the two genera cannot be otherwise separated. There are also often lobes of abortive leaves, destitute of parenchyma, and reduced to their nervures terminating in a glandular thickening, which have been regarded as branched hairs.

The structure of the male flower presents every possible modification, from the diplostemonous type of the andrœcium to the indefinite arrangement of a variable number of naked stamens. Consequently, the only fixed characters that can be resorted to in the Euphorbiaceæ lie in the female flower, and, in this, in the gynœcium.

Hence the extent of the researches relating to this organ. Its development has been followed in all the plants cultivated in the Paris gardens and hot-houses, from the appearance of the carpellary leaves upon a common, central, isolated axis, up to the time when the ovules developed higher up on the same axis have acquired their double integuments.

It is the outer integument that forms the caruncle of the Euphorbiaceæ, by a thickening of the exostome, and this in a constant manner. Its origin can no longer be attributed to the cellular cap which arises from the placenta and advances to meet the ovule. There is always a period when these two structures are completely independent, and their perfect contact takes place at the time when

the flower expands. If this cap is not at that time in perfect contact with the nucleus by means of a prolongation which it inserts into the exostome, the nucleus itself acquires a sudden and excessive development, and sends out to the cap a long slender process, varying much in form in different genera.

As the direction and structure of the ovule and seed alone constitute fixed characters in the Euphorbiaceæ, the limitation of this order must be modified, both by the addition of new genera hitherto regarded as distinct, and by the exclusion of several others. The species of *Buxus*, and with them *Tricera*, *Sarcococca*, and *Pachysandra*, are in the latter category. The development of their placentation is centripetal; their ovules are anatropous in the direction opposite to those of the Euphorbiaceæ, with the raphe exterior, the micropyle superior and interior. The fleshy production which crowns their seeds is not a micropylar caruncle, but proceeds from the funiculus. On the same grounds, the Stylocereæ, separated from the Euphorbiaceæ, form a small separate group near the Buxææ.

The Antidesmeæ, on the contrary, and the Scepacææ reduced to the genus *Aporosa*, cannot be separated from the Euphorbiaceæ, for they all have the gynæcium of this order at a certain epoch. Their fruit is unilocular and monospermous only through consecutive abortions. The number of loculi, of the seeds, the direction and structure of the latter, present no difference at the outset.

The study of the organogeny has demonstrated the same fact in *Callitriche*, the ovary of which is bilocular and the cells bi-ovulate at first. This arrangement is merely disguised, subsequently, by the appearance of a false septum comparable to that of *Linum*, which produces an ovary with four half-cells, each with one seed.

The order Euphorbiaceæ, as sketched by the author, is therefore enriched by the Scepacææ, Antidesmeæ, and Callitrichaceæ, while it loses the Buxaceæ proper.—*Comptes Rendus*, July 26, 1858.

On 'Hautlé,' or Animal Bread, of the Mexicans.

By M. GUÉRIN-MÉNEVILLE.

In the 'Bulletin de la Société Impériale Zoologique d'Acclimatation,' M. Guérin-Ménéville has published a very interesting paper on a sort of bread which the Mexicans call 'Hautlé,' and which is made of the eggs of three species of Hemipterous insects belonging to the group of Water-bugs.

According to M. Craveri, by whom some of the Mexican bread, and of the insects yielding it, were brought to Europe, these insects and their eggs are very common in the fresh waters of the lagunes of Mexico. The natives cultivate in the lagune of Chalco a sort of *Carex* called 'Toulé,' on which the insects readily deposit their eggs. Numerous bundles of these plants are made, which are taken to a lagune (the Tezcuco), where they float in great numbers in the water. The insects soon come and deposit their eggs on the plants; and in

about a month the bundles are removed from the water, dried, and then beaten over a large cloth, to separate the myriads of eggs with which the insects had covered them. These eggs are then cleaned and sifted, put into sacks like flour, and sold to the people for making a sort of cake or biscuit, called 'Hautlé,' which forms a tolerably good food, but has a fishy taste, and is slightly acid. The bundles of *Carex* are replaced in the lake, and afford a fresh supply of eggs, which process may be repeated for an indefinite number of times.

Moreover, says M. Craveri, the Mexicans collect quantities of these insects from the surface of the water by means of hooped nets, and these are dried and sold as food for birds. In Mexico these dried insects are sold in the streets and markets, the dealers crying "Moschitos, Moschitos," just as in Europe they cry "Food for your singing birds."

It appears that these insects have been used from an early period; for Thomas Gage, who sailed to Mexico in 1625, says, in speaking of articles sold in the markets, that they had cakes made of a sort of scum collected from the lakes of Mexico, and that this was also sold in other towns.

Brantz Mayer, in his work on Mexico ('Mexico as it was and as it is,' 1844), says, "On the lake of Tezcuco, I saw men occupied in collecting the eggs of flies from the surface of plants, and cloths arranged in long rows as places of resort for the insects. These eggs, called 'Agayacath,' formed a favourite food of the Indians long before the conquest, and, when made into cakes, resemble the roe of fish, having a similar taste and appearance. After the use of frogs in France, and birds'-nests in China, I think these eggs may be considered a delicacy; and I found that they are not rejected from the tables of the fashionable inhabitants of the capital."

The more recent observations of Messrs. Saussure, Sallé, Virlet d'Aoust*, &c., have confirmed the facts already stated, at least in the most essential particulars.

The insects which principally produce this animal farina of Mexico are two species of the genus *Corixa* of Geoffroy, Hemipterous insects of the family of Water-bugs. One of these species has been described by M. Guérin-Ménéville as new, and has been named by him *Corixa femorata*. The other, identified in 1831 by Thomas Say as one of those sold in the markets of Mexico, bears the name of *Corixa mercenaria*.

The eggs of these two species are attached in innumerable quantities to the triangular leaves of the *Carex* forming the bundles which are deposited in the water. They are of an oval form, with a protuberance at one end and a pedicel at the other extremity, by means of which they are fixed to a small round disk, which the mother cements to the leaf.

Among these eggs, which are grouped closely together, and sometimes fixed one over another, there are found others, which are larger, of a long and cylindrical form, and which are fixed to the same leaves.

* Ann. Nat. Hist. 3 ser. vol. i. p. 79.

These belong to another, larger insect, a species of *Notonecta*, which M. Guérin-Méneville has named *Notonecta unifasciata*.—*Pharmaceutical Journal*, Sept. 1, 1858.

New Experiments on Ægilops triticoides. By Dr. GODRON.

Observations made at Montpellier on the awned and awnless forms of *Ægilops triticoides*, which are met with there in a wild state, led the author to regard this plant as a hybrid of *Ægilops ovata* fertilized by the pollen of wheat ("Quelques Notes sur la Flore de Montpellier," Besançon). Desirous of confirming or negating this supposition by direct experiment, Dr. Godron tried, in 1853, to reproduce this vegetable form by artificial fecundation, and in 1854 he obtained plants of *Ægilops triticoides* ("De la Fécondation des *Ægilops* par des *Triticum*," Ann. des Sc. nat. sér. 4. Botanique, ii. p. 218. See also Comptes Rendus, 17 July 1854, and Ann. Nat. Hist. 2nd ser. xiv. p. 394). These facts were confirmed, in 1856 and 1857, by the experiments of MM. Regel in Germany, Vilmorin and Grœnland at Paris, and Planchon at Montpellier. *Ægilops triticoides* is therefore a hybrid plant. The author considers that no doubt can remain on this question. (See Journal of the R. Agric. Soc. of England, xix. part 1. p. 103, 1858.)

Ægilops triticoides is most frequently sterile; but sometimes, though rarely, it affords fertile seeds; and it is these seeds which, in the hands of M. Fabre of Agde, have produced *Ægilops speltaformis*. As Dr. Godron could not doubt the exactitude of the facts reported by this skilful and conscientious observer, and was on that account quite convinced that *Ægilops speltaformis* arose from *Ægilops triticoides*, he at first sought to explain this transformation on the foundation of a law accepted by almost all the authors who have studied the physiological phænomenon of hybridity, namely that fertile hybrids return to one of their original types after a certain number of generations. *Ægilops triticoides* seemed to present a new confirmation of this law; *Ægilops speltaformis* is, in fact, more nearly approximate to wheat than *Ægilops triticoides*; and, supposing the law in question to be true, the natural conclusion was, that *Ægilops speltaformis* reverted insensibly to *Triticum vulgare*. The author now doubts much whether that law is solidly established. On the one hand, this return of *Ægilops triticoides* to its male type, through *Ægilops speltaformis*, is so long in coming to pass, that it may be despaired of. On the other hand, the experiments he has made upon hybrids in general, and especially hybrids of *Verbascum* and *Digitalis*, have led him to think that fertile hybrids are ordinarily only produced when they are fecundated anew by one of the two specific types which have given birth to them. All the hybrid plants he has hitherto obtained by artificial fecundation have been sterile, with the exception of flowers which he has fecundated with the pollen either of the male or female parent; he has then mostly obtained fertile seeds, and the product of this new fecundation then approached nearer to the male type.

Might it not be the same with *Ægilops triticoides* when it is fertile? Dr. Godron was desirous of making certain of this by the experimental method; and for this purpose it was necessary to produce this *Ægilops* anew at Nancy, as he had previously done at Montpellier. He obtained several plants of it, some of which were fecundated with wheat in the summer of 1857. This new fecundation by the male type afforded nine seeds, which germinated perfectly. They were sown in autumn, and protected from excessive cold in a frame. These plants flowered, and produced *Ægilops speltæformis*, resembling that which Dr. Godron had cultivated for four years, and which was derived from seed from the Paris Garden. Dr. Godron compared the two plants in a fresh state: they were sown at the same time, but separately; they flowered in the same week, and he could not detect any difference between them. Finally, he adds that the ovaries of this *Ægilops speltæformis* obtained artificially have already (June 29th) acquired their normal size, and appear well developed: he has reason to think that they will furnish fertile seeds, like the *Ægilops speltæformis* cultivated by M. Fabre.

Ægilops speltæformis is, then, a new hybrid plant resulting from the fecundation of *Ægilops triticoides* by *Triticum vulgare*; it is a true *quadroon*, if we may use here a term by which is designated one of the degrees of crossing between the Negro and the Caucasian race.

The author anxiously invites botanists interested in this question to repeat his new experiments; and they will be convinced. This same year, however, experiments similar to the above, the results of which are as yet unknown to him, will serve to check the author's. They have been made by MM. Vilmoren and Groenland. Lastly, M. J. Gay brought from Beziers last year a seed of the wild *Ægilops triticoides*, which has germinated. This learned botanist will doubtless make known the result which it will produce.—*Comptes Rendus*, July 19, 1858.

On a new species of Platyrrhynchus from the Rio Napo, in the Republic of Ecuador. By PHILIP LUTLEY SCLATER, M.A.

PLATYRRHYNCHUS CORONATUS, Verreaux, MS.

Brunnescenti-olivaceus, alis caudaque fuscis, pilei cristati parte mediali flavissima laterali utrinque castanea; linea superciliari et altera a rectu descendente nigris; lorix et corpore subtus cum tectricibus subalaribus sordide flavicantibus; rostro superiore nigro, inferiore albicante; pedibus pallide fuscis.

Long. tota 3·8, alæ 2·4, caudæ 1·2, rostri a rectu ·55, tarsi ·55.

This is a typical species of the genus *Platyrrhynchus* with the bill nearly of the same breadth and shape as in *P. cancruma*, and of the general size and form of that species; but it is easily recognizable by its bright yellow crest being broadly margined with deep chestnut, and by the shorter and more slender tarsi. These two birds and *Platyrrhynchus rostratus* are the only members of the group with which I am acquainted.—*Proc. Zool. Soc.* Jan. 26, 1858.

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[THIRD SERIES.]

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XXXI.—*On Permian Entomostraca from the Fossiliferous Limestone of Durham.* By J. W. KIRKBY.

[With a Plate.]

MR. RUPERT JONES first noticed the occurrence of Entomostraca in the Permian System of England. In Prof. King's Monograph of the Permian Fossils of England, he (Mr. Jones) describes several species, which were principally obtained from the upper beds of the Durham Permians*. With the exception of the notice of a single species by Prof. King, from a Permian deposit near Tullyconnel in the county of Tyrone, Ireland†, no additional observations have been published on Permian Entomostraca in Britain.

In 1851–53 Dr. Reuss described ten species from the Permians of Germany, which were found in the Unter Zechstein of Bleichenbach and Selters, in the Wetterau‡. Some of the species he considered to be new, others to be identical with forms found in the upper beds of Durham.

From the Permian rocks of Russia, six new species were described by Alex. Graf Keyserling, in 1854§.

In 1855, M. Richter noticed the occurrence of eight species in the Unter Zechstein of Saalfeld. Among them was one new form; the rest were referred to species that had been previously described by Jones and Reuss||.

* Monograph of Perm. Foss. of England, pp. 58–66.

† Journal of the Geological Society of Dublin, vol. vii. p. 78.

‡ Jahresbericht der Wetterauer Gesellschaft, 1851–1853, pp. 65–70.

§ Reise durch die Tundren der Samojeden, Dorpat, 1854, pp. 111–113. pl. 4. Permian Entomostraca were observed in Russia previous to this date; but the notices of them merely mention the fact of their occurrence, without specific details. See Table of Formations of the Government of Simbirsk of Jaaykow, 1844, Petersb. Miner. Gesellsch.

|| Zeitschr. der Deutsch. Geol. Gesells. vol. vii. pp. 526–533.

These, I believe, comprise all the Permian Entomostraca which have been noticed up to the present time.

The following remarks refer to the Entomostraca belonging to the fossiliferous or shell-limestone of the Permian System of Durham. This deposit lies below the beds whence the species described by Mr. Jones were procured. It occupies a central position in the calcareous beds of the system, being situated between the lower or compact limestone and the various beds of the upper members. Consequently the Entomostraca of this deposit belong to a period antecedent to that of the previously described Durham species. In Britain they have not yet been observed in Permian rocks of an earlier date; but in Germany they occur, as before stated, in the Lower Zechstein, which is equivalent to our compact limestone. This proves their existence during the deposition of the first calcareous beds of the Permian series of Western Europe, and gives them a place in the fauna of each of the three members into which this series of rocks has been divided. Although they appear to have existed throughout the period during which the whole of the calcareous beds were accumulated, it is evident that their distribution was not at all general: otherwise their absence in the compact limestone of Durham, in the Zechstein Dolomit, Stinkstein, and Rauchwacke of Germany, would not have been observed; nor would they have been so rare, in respect to localities, in those members in which they do occur. In the upper beds of Durham they are only found in one locality (Byers' Quarry)*. In the fossiliferous limestone they are only found at Tunstall, with the exception of a stray example occasionally met with at Humbleton Hill. At Tunstall Hill they are not generally dispersed throughout the locality; it is only at one particular spot that they occur in any abundance,—or rather, in which they have occurred, for the spot seems already exhausted. In this place they were very plentiful, some hundreds of specimens having been obtained from a few cubic feet of matrix.

In the limestone of Tunstall Hill, there occur cavities which are filled with brown or yellow calcareous dust. Sometimes they contain yellow or brown dust, and nothing more; at others, groups of very finely preserved fossils are mixed with the dust. These cavities have already been noticed by Mr. Howse, who long ago detected the richness of their contents†. It was in one of these that I found the various forms of Entomostraca to be noticed in this paper. It is questionable whether a better matrix

* See Jones in Mon. Perm. Foss. p. 60.

† Catalogue of Fossils of Perm. Syst. of Northumb. and Durham, p. 9. Mr. Howse has also observed similar cavities in the fossiliferous limestone of Silksworth.

for the preservation, and subsequent extraction, of microscopic organisms, than this in which these Entomostraca occurred, can be conceived. It has preserved the specimens which it encloses so perfectly, that they almost rival the productions of recent zoology. In some instances a brush will remove the investing matrix, without the use of other tools. Occasionally the dust occurs in a state of semi-coherency, with nodules or fragments of limestone intermixed. In this state the imbedded fossils are also easily extracted without much assistance from palæontological instruments. Some of the finest specimens ever taken from the Durham Permians have been got from these cavities; and they have also yielded some of the rarest species. An analytical examination of the contents of some show very curious results. For instance, in one I found about one hundred and fifty perfect and imperfect spines of *Archæocidaris Verneuiliana*, King, and with them but one or two fragments of the plates of the same species. In another I got more than four hundred dorsal valves of young individuals of *Strophalosia Goldfussi*, Münst., which were accompanied by only fifteen ventral valves. Of course, in both cases other species were associated; but those mentioned were the most prevalent, and by their abundance and peculiar mode of occurrence formed the characteristic feature of the contents of each cavity. Such facts are very puzzling, and would almost seem indicative of a drifting of specimens prior to fossilization,—an idea which is scarcely tenable when the general evidence of the whole fauna is considered.

The majority of the specimens of Entomostraca which were found belong to species of *Bairdia*, with scarce, but good, examples of a *Leperditia*-like species, previously noticed in the upper members by Jones, and provisionally referred by him to the genus *Dithyrocaris* of Scouler*. The *Bairdiæ* generally occurred with united valves, though single valves were not uncommon. Specimens of the latter species were nearly always in a detached state, only three or four per cent. occurring with valves connected. The valves of *Bairdia* possess a stronger hinge than the latter, one valve overlapping the other along the dorsal margin, while the valves of the other appear to have been merely united by membrane. This difference in the mode of hinging seems to explain their manner of occurrence. None of the specimens are worn, nor show indications of drifting. The acute extremities of several of the species, and the delicate margins of the detached valves, never present traces of attrition; so that it may be inferred that these Entomostraca were original residents in the area where they have become imbedded and fossilized.

* Mon. Perm. Foss. of England, p. 64, and the remarks on this species in the present paper.

In the calcareous dust which contained the Entomostraca were also a number of specimens of a curious Foraminifer, apparently a species of *Miliolina**. Several species of Mollusca also occurred, as *Productus horridus*, *Spiriferina multiplicata*, *Camarophoria Schlotheimi*, *Crania Kirkbyi*, *Monotis speluncaria*, *Pleurotomaria nodulosa*, &c. The convex valve of the conchifer appears to have been a popular place of resort with the *Bairdia*. Out of one I procured some dozens of individuals.

It is also worthy of remark, that in close vicinity to the Entomostraca there occurred some of the rarest Permian fossils, and others that were previously unknown; also an abundance of specimens belonging to species hitherto rare in the limestone of Tunstall: so that the evidence deducible from the fossils associated with the Entomostraca, and from those in their immediate neighbourhood, may imply some peculiarity of conditions pertaining to this particular area during the deposition of the fossiliferous limestone.

During the Permian period, the prevailing forms of Entomostraca seem to have belonged to two groups,—to *Bairdia*, and to an undetermined genus, of which *Dithyrocaris*? *Permiana*, Jones†, and *Cythere*? *Roessleri*, Reuss‡, are members. *Bairdia* is the most characteristic of the Permians of Western Europe; in fact, it is unknown as yet in the Permian rocks of Russia. In Germany it is represented by several species, and by a greater number in Durham; a single species occurs in the Yorkshire Permians; and Prof. King has observed another(?) in the Permian deposit of Tullyconnel. In the fossiliferous limestone of Durham the Entomostraca almost exclusively consist of species of this genus, from which it may be inferred that the conditions prevailing during the accumulation of that deposit were highly suitable for their development. *Bairdia* seems to represent the Mesozoic element in this section of the Permian fauna, it being more properly a Mesozoic group, although it is first met with in Palæozoic beds. As a connecting link with the older rocks, the generic form typified by the above species, *D. Permiana* and *C. Roessleri*, may be noticed as a representative of its more ancient prototypes, the *Beyrichia* and *Leperditia* of the early Palæozoics. This form predominates in Russia; three species occur there§. Another is found in Germany, and two in Durham. According to our present knowledge, these species are all that belong to this genus, no similar forms having, as yet, been found in other rocks; con-

* It is the same fossil as Geinitz's *Serpula pusilla* and the *Spirillina pusilla* of Jones.

† Mon. Perm. Foss. p. 66.

‡ Jahres. Wetter. Gesell. 1851–1853, p. 70.

§ Reise durch die Tundren der Samojeden, 1854, p. 112.

sequently it is pre-eminently characteristic of Permian deposits. Associated with the species belonging to the above groups are a few forms which have been referred to *Cythere*, *Cythereis*, and *Cytherella*, all of which, with one exception, are found in the upper Permian beds of Byers' Quarry, and some of which also occur in the Lower Zechstein of Germany. In the former beds these forms are in the ascendant, being seven in a list of twelve species found therein. The difference in generic affinity observed in the species of these beds from those found in the fossiliferous limestone, which almost occupies the same area of distribution, may be indicative of peculiar conditions. It is generally assumed by geologists of Permian repute, that the upper beds of Durham originated in comparatively shallow water; nor is it an unwarrantable assumption, as some of the beds are ripple-marked*, and in others there are found occasionally the remains of *Algæ†*, —facts which certainly do not imply any great depth of water. So, supposing littoral conditions to have prevailed during their period of deposition, the differences observed in the generic relations of the species may, in some measure, be due to them; and the Byers' Quarry group of Entomostraca may represent some of those species which loved a habitat of shallow depths in this Permian age; while in those found in the fossiliferous limestone, which belong so exclusively to *Bairdia*, we may possess a group of pelagic species which dwelt in the waters of a Permian ocean. Although this is advanced as a mere suggestion, so far as evidence is derivable from the species in question, yet it is an idea which is supported by many collateral facts that may be deduced from the general fauna of this deposit.

The list of Permian Entomostraca is now rather extensive. Twelve species were described by Jones in 1850. In this paper six new forms will be noticed, besides three previously discovered in Germany, but new to Durham; so that, in all, the Permians of Durham will possess a list of twenty-one species, thirteen of which are peculiar to them. Eight species appear to be common to the deposits of Germany and Durham, some of which have existed from the deposition of the Lower Zechstein, the equivalent of our compact limestone, until the last of the Permian beds were accumulating. Five species are peculiar to Germany; and six have been found in Russia, which are as yet unknown in the West. These, with the British species, make thirty-two species of Entomostraca belonging to the Permian strata of Europe.

* Prof. King observed ripple-marks in the upper yellow limestone on the site of the South Docks, Sunderland; and I have also seen slabs marked with them in the Fulwell Quarries.

† From the upper limestone beds between Hawthorne Hive and Black Hall Rocks on the Durham coast.

For the convenience of those who may find fossil Entomostraca, or other small organisms, in a similar matrix to that in which the Tunstall specimens occurred, it may be well to add a word or two as to the mode I adopted for extracting the Permian specimens from the calcareous dust. I first sifted the dust of all the coarser particles—of everything larger than the tenth of an inch; and from what was left I took all the very fine dust with another sieve, leaving a residue among which everything organic could easily be distinguished. In picking out the organisms, a piece of polished slate—a common school slate, for instance—is a good area on which to strew a portion of the residue for examination. It is much better to adopt this method than to pick the specimens out of a mass of material; for by sprinkling a small portion over the slab, every individual particle can be recognized, and the organic forms separated from the inorganic with very little trouble. A pair of blunt forceps with broad points are exceedingly useful for picking up the specimens. Some care is necessary, or injury may result to the specimens; but, with caution and a little skill, the forceps can be used with a great delicacy of touch, and with less risk than the fingers. Dr. Carpenter recommends the use of the moistened tip of a camel's-hair pencil in similar cases; and in instances where the objects sought are extremely delicate, it will be the more preferable instrument: but when the specimens, like the Permian Entomostraca, possess a moderate degree of firmness, they may be extracted with greater ease and celerity as above indicated; and when an extensive series of examples is needed, expedition is of some value. With the assistance of a common lens and a pair of moderately good eyes, nothing more is required. It is perhaps best to pick out a quantity of specimens “in rough,” and separate the specific forms afterwards.

Genus *Cythere*, Müller.

Subgenus *BAIRDIA* [M'Coy], Jones, Entomostraca of the Cretaceous Formation of England.

SYN. Genus *Bairdia*, M'Coy, 1844, Syn. Char. Carb. Foss. of Ireland.

This group was instituted by Prof. M'Coy in 1844 for the reception of two species of Entomostraca from the carboniferous rocks of Ireland, which he considered to differ generically from any existing genus*.

Mr. Rupert Jones, in his Monograph of the Entomostraca of the Cretaceous Formation of England, 1848, proposed its adoption as a subgenus of *Cythere*, giving a good definition of its

* Synopsis of the Characters of the Carboniferous Fossils of Ireland, page 164.

subgeneric characters, which had scarcely been done by M'Coy*. I attach to it a similar value in these remarks.

Dr. Baird has placed it, as modified by Jones, among his synonyms of *Cythere*. He states that no anatomical difference exists in the animal of those recent species referred to it by Jones, from the animal of *Cythere proper*†. This is certainly a strong point in support of its near affinity with *Cythere*; but still, with its marked peculiarity of carapace, I think it may be fairly entitled to a distinctive term to distinguish it from the typical forms of *Cythere*. At least, whether it really be a natural subgenus or not—supposing such to exist—it is a very convenient group in palæontology, as it serves to mark a number of fossil Entomostraca of peculiar character, which have repeatedly held no unimportant position in the economy of ancient faunas.

The subgeneric characters of *Bairdia* have already been given by Mr. Jones. The Permian species add little that is new to them, though I will recapitulate the generic features of these forms. They are all smooth. The general form of the majority is somewhat triangular or subpentagonal, though species of a different contour occur. The posterior extremity of all is more pointed than the anterior, and it is generally rostrated. The anterior extremity is usually rounded, but in one or two instances it is subangulated; it is also much wider than the former. The ventral margin is always the straightest, though often somewhat sinuated. The dorsal margin is more or less convex centrally, and generally sinuated towards the posterior extremity. In lateral contour‡ they are lenticular, variously modified, being sometimes almost exactly lenticular, at others, by the extreme position of greatest diameter, subcuneiform. Perhaps the most important generic character of *Bairdia* is its hingement, which is a lapping of the left valve over the right along the dorsal margin, and which was first noticed by Mr. Jones. In some Permian species the folding of the valves is great (*B. plebeia* and *B. ventricosa* may be cited as examples); and in most cases the folding is much greater in the centre than near the extremities. In general this character does not vary much in Permian species. A central third of the ventral margin of the left valve overlaps an equivalent portion of the right, giving the contact-line of the ventral margins a sinuated appearance. The mode of its overlapping is this:—from each extremity, until approaching the central por-

* Entomostraca of the Cretaceous Formation of England, p. 22.

† Natural History of the British Entomostraca, p. 163.

‡ The term "lateral contour" is used for the outline which is seen by viewing the carapace ventrally. "Ventral aspect" is used in similar instances by others; but as it is chiefly the contour of the sides of each valve of the carapace that is referred to when using the term, I think the former better expresses the meaning attached to it.

tion of the ventral margin, the extreme edges of each valve are somewhat produced, and lie against each other in close juxtaposition, like the valves of a conchifer; towards the centre, however, the edges become flattened and bent inwards, forming slight horizontal ledges or flanges, that of the right valve being rather smaller than the other which overlaps it. In no instance does the whole margin of one valve overlap that of the other; in no species is more than a third overlapped, sometimes less. The length of margin overlapped, and its width, are of use as specific characters, as is also its position, which is not constant, being sometimes nearer one extremity than the other.

Although nearly all the species of *Bairdia* possess a contour more or less resembling those species which may be considered typical of the group, such as *B. curta* (Carboniferous), *B. plebeia* (Permian), and *B. subdeltoidea* (Cretaceous), there are others which show a great aberration in outline from these types, and, so far as their general form is concerned, have a much nearer resemblance to *Cythere* than to *Bairdia*; their hingement, however, being that of *Bairdia*, leaves no doubt of their true affinity. Among the Permian species, *B. reniformis*, *B. Berniciensis*, and *B. Jonesiana* are the most aberrant in this respect.

1. *Bairdia plebeia*, Reuss. Pl. X. figs. 1, 2, & 2 a.

B. plebeia, Reuss, Jahresbericht der Wetterau. Gesell. 1851-1853, p. 67.

SYN. *B. curta*, M'Coy, Jones, Mon. Perm. Foss. of England, p. 61. tab. 18. fig. 3.

Length $\frac{1}{15}$ inch; height $\frac{1}{30}$ inch.

Carapace subtrigonal, somewhat inflated centrally, surface smooth. *Dorsal margin* prominently convex, sometimes rather flatly convex; *posterior slope* abrupt, slightly concave; *anterior slope* less abrupt, straight, or slightly concave. *Ventral margin* straight centrally, more or less convex towards each extremity. *Anterior extremity* rounded, and rather produced. *Posterior extremity* acute, rostrated. *Lateral contour* regularly lenticular; *greatest diameter* (of lateral contour, or width of carapace) two-thirds of the height. *The flange*, or overlapping portion of the ventral margin of left valve, short, subcentral. *Hinge* with the left dorsal margin overlapping the right extensively.

Mr. R. Jones has identified a very similar form, found in the upper members of the Durham Permians at Byers' Quarry and in the fossiliferous limestone of Humbleton Hill, with the *B. curta* of M'Coy. I think it very probable that the former is identical with the present species, although the figure and description of Jones are somewhat different,—a difference, however, which is most likely due to the state of preservation in which his specimens occurred, being casts. His figure represents the

posterior extremity much shorter, and not so acute as the same member in perfect examples of *B. plebeia*; the anterior extremity is also angulate dorsally,—a character unknown to the latter species, whose anterior extremity, though sometimes a little produced, is always more or less rounded. These characters, with a slight sinuosity in the ventral margin, are the only points in which it differs from the present species; and as the specimens from which they were obtained were, as above stated, casts, I think they may be assumed to be accidental, and of little specific value. This being the case, the identification with *B. curta* is probably erroneous; for, according to M'Coy's description and figure of that species, its general form is more elongate, and its extremities are more acutely rostrated, especially the anterior, than those of *plebeia*; it also possesses a deep sinus in its ventral margin, and shows a marked difference in lateral contour, being subcuneiform, while the other is lenticular. It has other peculiarities; but those mentioned appear sufficient to demonstrate its being specifically distinct from *B. plebeia*.

B. plebeia occurred very plentifully along with the other Entomostraca found in the fossiliferous limestone at Tunstall Hill, also rarely at Humbleton Hill, and not unfrequently in the upper beds at Byers' Quarry.

It is found in the Lower Zechstein at Bleichenbach, Selters, and probably at Saalfeld in Germany.

Var. *elongata*. Plate X. figs. 4 & 4 a.

Length $\frac{1}{13}$ inch; height $\frac{1}{33}$ inch.

This is a more elongate form than the preceding. Its posterior and anterior slopes are more gradual, and its anterior extremity is more produced and more compressed laterally than in that form.

Var. *compressa*. Pl. X. figs. 7 & 7 a.

Convexity of dorsal margin regular; sinus of posterior slope nearly obsolete; posterior extremity less acute than the typical form. Valves compressed laterally, the greatest diameter being only a little more than half the height; position of greatest diameter in posterior half.

Var. *Neptuni*. Pl. X. figs. 5 & 5 a.

The form to which I have attached the name *Neptuni* shows several peculiarities, which might almost be considered of specific importance had they been constant; but when a series of specimens is examined, it is seen to approach, by gradations, the typical forms of *B. plebeia*, so that it seems necessary to include it along with other varieties of that species.

It differs in having the greatest convexity of the dorsal margin posteriorly situate, consequently in possessing an abrupt posterior slope and a very gentle anterior depression; in the blunt but beaked posterior extremity, and in its more compressed lateral contour.

2. *Bairdia ventricosa*, n. sp. Plate X. figs. 3 & 3 a.

Length $\frac{1}{20}$ inch; height $\frac{1}{40}$ inch.

Carapace subrhomboidal, ventricose, smooth, rather protuberant ventrally in anterior half. *Dorsal margin* flatly convex; *posterior slope* abrupt, descending three-fourths of the height, deeply sinuate close to posterior extremity; *anterior slope* steep. *Ventral margin* slightly sinuous, rising rapidly anteriorly. *Anterior extremity* rather acute, the dorsal and ventral margins almost forming a right angle at their juncture. *Posterior extremity* prolonged into a narrow bluntish point. *Lateral contour* almost lenticular, ventricose, sinuated anteriorly. Dorsal margin of left valve strongly overlapping that of the right, especially in the centre. The *flange* of left ventral margin short, situate a little beyond the centre and in posterior half.

The principal characteristics of this species are its ventricosity, its blunt produced posterior extremity, its angulated anterior extremity, and its slightly sinuous ventral margin.

It frequently occurred in the fossiliferous limestone of Tunstall Hill.

3. *Bairdia Reussiana*, n. sp. Pl. X. figs. 6 & 6 a.

Length $\frac{1}{8\frac{1}{2}}$ inch; height $\frac{1}{45}$ inch.

Carapace somewhat reniform, flatly convex, smooth. *Dorsal margin* flatly convex; *posterior slope* abrupt, deeply sinuate near its juncture with the ventral margin; *anterior slope* gentle. *Ventral margin* with a deep sinus near the centre, becoming rapidly convex posteriorly; towards posterior extremity margins of valves produced. *Anterior extremity* rounded. *Posterior extremity* beaked. *Lateral contour* sublenticular, with a flat central region, slightly concave and produced posteriorly; *greatest diameter* one-fourth of length. *Flange* of left ventral margin anteriorly situate. *Hinge* with the left dorsal margin overlapping the right, more so centrally than towards extremities.

B. Reussiana rather resembles some of the forms of *B. plebeia*. I have been induced to separate it from that species on account of its having a sinuate ventral margin, a comparatively blunt and high beak, a less prominent dorsal margin, consequently a greater length compared with its height, and a compressed lenticular lateral contour.

It is dedicated to Dr. Reuss, who has contributed a valuable paper on the Entomostraca of the Permians of Germany.

Found rarely in the fossiliferous limestone of Tunstall Hill.

4. *Bairdia Kingii*, Reuss. Pl. X. figs. 8 & 8 a.

B. Kingii, Reuss, Jahresbericht der Wetterau. Gesell. 1851-1853, p. 67.

Length $\frac{1}{2}$ inch; height $\frac{1}{3}$ inch.

Carapace subpentagonal, smooth. *Dorsal margin* arched. *Ventral margin* sinuate, becoming rapidly convex at each extremity. *Anterior* and *posterior extremities* almost alike, subangulate, the posterior a little less pointed than the anterior. *Lateral contour* lenticular, slightly concave posteriorly; greatest diameter one-fourth the length, centrally situate.

Although I have identified the form just described with *B. Kingii*, Reuss, there exists a little difference in the general outline. Reuss's figure represents the anterior extremity more pointed, and the posterior wider and rounder, than the same features in the Durham form. In other respects they agree; so that it is perhaps better to consider those slight variations to be of little importance, than to risk creating a synonym.

B. Kingii was first observed by Dr. Reuss in the Lower Zechstein of Bleichenbach. It is a rare species in the fossiliferous limestone of Tunstall Hill.

5. *Bairdia mucronata*, Reuss. Pl. X. figs. 9, 10, & 11?

B. mucronata, Reuss, Jahresbericht der Wetterau. Gesell. 1851-53, p. 67.

Length $\frac{1}{6}$ inch; height $\frac{1}{3}$ inch.

Carapace subcuneiform, smooth, ventricose centrally, compressed towards extremities. *Dorsal margin* convex centrally; *anterior slope* slight, only one-fourth of height, somewhat concave, joining the ventral margin almost at a right angle; *posterior slope* deeply sinuate, falling three-fourths of height, more or less abruptly. *Ventral margin* almost straight, or slightly sinuate. *Anterior extremity* wide, subangular, sometimes angular. *Posterior extremity* acutely rostrated, very much produced, and occasionally curved upwards. *Lateral contour* nearly lenticular, slightly concave at each extremity; greatest diameter rather more than one-fourth of length, centrally situate. *Flange* of left ventral margin long, but narrow, posteriorly situate. *Hinge* with left dorsal margin rather largely overlapping the right.

This fine species is subject to modifications of outline. Figs. 9, 10, and 11? represent the most common forms. Its sharp, produced posterior extremity, which is the characteristic feature of the species, varies in length; fig. 10 gives the most produced form. Some individuals have the anterior extremity

angulated; others more rounded, though of a subangulated outline. The sinus of the ventral margin is scarcely indicated in some specimens. The contour of the dorsal margin undergoes slight variations.

In identifying this species with *B. mucronata* of Dr. Reuss, I have allowed a little for probable imperfection in his material, or for slight modification of form which may have been induced by some unknown causes. It is the first reason, however, that has influenced me most; for all the specimens of *Entomostraca* which I have seen from the locality whence Dr. Reuss procured this species are in a very unsatisfactory state, and not at all to be relied on for exactness of original form; so that it is not unlikely that the specimen or specimens from which he described, and which he figured, were in some measure imperfect. Should this not be the case, and should his figure represent a perfect individual, then our Durham form, with which I have identified it, must be made a distinct species.

Found rather commonly in the fossiliferous limestone of Tunstall Hill. It is rare in the Lower Zechstein of Bleichenbach, and occurs in the same deposit at Saalfeld, Germany.

6. *Bairdia* ———? Pl. X. figs. 12 & 12 a.

Length $\frac{1}{20}$ inch; height $\frac{1}{30}$ inch.

Carapace subrhomboidal, attenuate, smooth. *Dorsal margin* arched; *anterior slope* moderately steep, descending one-third of height; *posterior slope* gradual, descending two-thirds of height. *Ventral margin* with a central sinus, convex near extremities. *Anterior extremity* angulate at the juncture of dorsal and ventral margins, which almost form a right angle; ventral curve of extremity rather convex. *Posterior extremity* pointed, convex ventrally, somewhat concave dorsally. *Lateral contour* very attenuate; *greatest diameter* central, less than one-fifth of the length.

I have only found a single example of this form, and it is scarcely so well preserved as I could wish: and there exist some doubts in my mind as to the propriety of describing it as a species; for it may be but a variety of *B. mucronata*, and the somewhat imperfect condition of the specimen rather invalidates the authenticity of the specific characters which appear to distinguish it. Of this, however, there can be no certainty until other and better specimens are procured. The evidence deducible from this single example seems to favour the idea of its being a species. Its attenuate form, and other peculiarities already noticed, seem to point to specific distinction; and, relying in some measure on these characters, I have thought it advisable to keep it separate from any of the preceding species, and to

describe it provisionally as one that is new, to which, however, I forbear adding a name, which may be attached when its specific identity is more firmly established.

7. *Bairdia reniformis*, n. sp. Pl. X. figs. 13 & 13 a.

Length $\frac{1}{33}$ inch; height $\frac{1}{73}$ inch.

Carapace subreniform, flatly convex, obtuse marginally, smooth. *Dorsal margin* almost straight centrally, but slightly inclined towards the anterior extremity; *anterior slope* short, convex; *posterior slope* abrupt, convex, falling two-thirds of height. *Ventral margin* sinuous, convex towards extremities, with a rather deep sinus anteriorly situate. *Anterior extremity* rounded. *Posterior extremity* obtusely pointed. *Lateral contour* sublenticular, compressed, convex towards extremities, more so posteriorly than anteriorly; *greatest diameter* central, rather more than one-fourth of length. *Hinge* with left dorsal margin moderately and regularly overlapping the right.

B. reniformis has some resemblance to *B. Reussiana*, and also to *B. Schaurothiana*. It may be distinguished from the former by its more *Cythere*-like form, by its more depressed dorsal margin, its convex posterior slope, its unrostrated posterior, and the greater width of the anterior extremity; it also differs in lateral contour, its extremities being convex and comparatively blunt. *B. Schaurothiana* has straighter dorsal and ventral margins than the present species; it is more produced anteriorly, and its posterior extremity is angulate; in lateral contour it differs in the acuteness of its extremities and in the position of its greatest diameter.

At first I was inclined to refer this species to *Cythere**, its general resemblance to that genus causing me to consider it to belong to it rather than to *Bairdia*; but I found its mode of hingement like that of *Bairdia*, so that there can be little doubt of its belonging to the same group.

Bairdia Schaurothiana, n. sp. Pl. X. figs. 14 & 14 a.

Length $\frac{1}{18}$ inch; height $\frac{1}{40}$ inch.

Carapace subhexagonal, dorsal half convex, ventral less so, protuberant about one-third from posterior extremity. *Dorsal margin* straight centrally; *anterior slope* convex, gradually descending rather more than one-third of height; *posterior slope* very abrupt, descending two-thirds of height in a right line. *Ventral margin* straight, rising abruptly to meet dorsal margin posteriorly, and very convex anteriorly. *Anterior extremity* regularly rounded, prominent. *Posterior extremity* angulate,

* To the recent forms *C. reniformis* and *C. albo-maculata*, for instance.

the dorsal and ventral margins forming a right angle. *Lateral contour* irregularly lenticular; greatest diameter one-fourth of height, posteriorly situate. *Hinge* strong. *Flange* of left ventral margin small, subcentral.

It is with great pleasure that I name this species after Baron von Schauroth of Coburg, to whose assiduous researches in the Permian rocks of Germany palæontologists are greatly indebted.

Found rarely in the fossiliferous limestone of Tunstall Hill.

Bairdia? Berniciensis, n. sp. Pl. X. figs. 15 & 15 a.

Length $\frac{1}{25}$ inch; height $\frac{1}{55}$ inch.

Carapace subrhomboidal, moderately convex, smooth. *Dorsal margin* convex; *anterior slope* descending rather more than one-third of height; *posterior slope* rather abrupt, descending about half of height, very convex. *Ventral margin* convex. *Anterior extremity* obliquely truncate. *Posterior extremity* rounded or bluntly pointed. *Lateral contour* sublenticular; *greatest diameter* posteriorly placed, more than two-sevenths of length.

This scarce form rather resembles the recent *Cythere acuta* in marginal outline.

Not being able to make out the hinging of this species, some doubts may exist as to its really belonging to *Bairdia*; but I place it in that group provisionally, until its true affinities be determined.

EXPLANATION OF PLATE X.

Fig. 1. Bairdia plebeia, Reuss: right valve; magnified 23 times.

Fig. 2. Ditto: left valve of another variety; magnified 23 times: 2 a, lateral contour, with contact-line of ventral margins.

Figs. 4 & 4 a. Ditto, var. *elongata*: left valve; magnified 23 times.

Figs. 5 & 5 a. Ditto, var. *Neptuni*: left valve; magnified 30 times.

Figs. 7 & 7 a. Ditto, var. *compressa*: right valve; magnified 25 times.

Figs. 3 & 3 a. Bairdia ventricosa, n. sp.: right valve; magnified 28 times.

Figs. 6 & 6 a. Bairdia Reussiana, n. sp.: right valve; magnified 26 times.

Figs. 8 & 8 a. Bairdia Kingii, Reuss: right valve; magnified 34 times.

Figs. 9, 10, & 9 a. Bairdia mucronata, Reuss: right valves; magnified 28 times.

Figs. 11 & 11 a. Bairdia mucronata?: left valve; magnified 28 times.

Figs. 12 & 12 a. Bairdia —, n. sp.?: right valve; magnified 29 times.

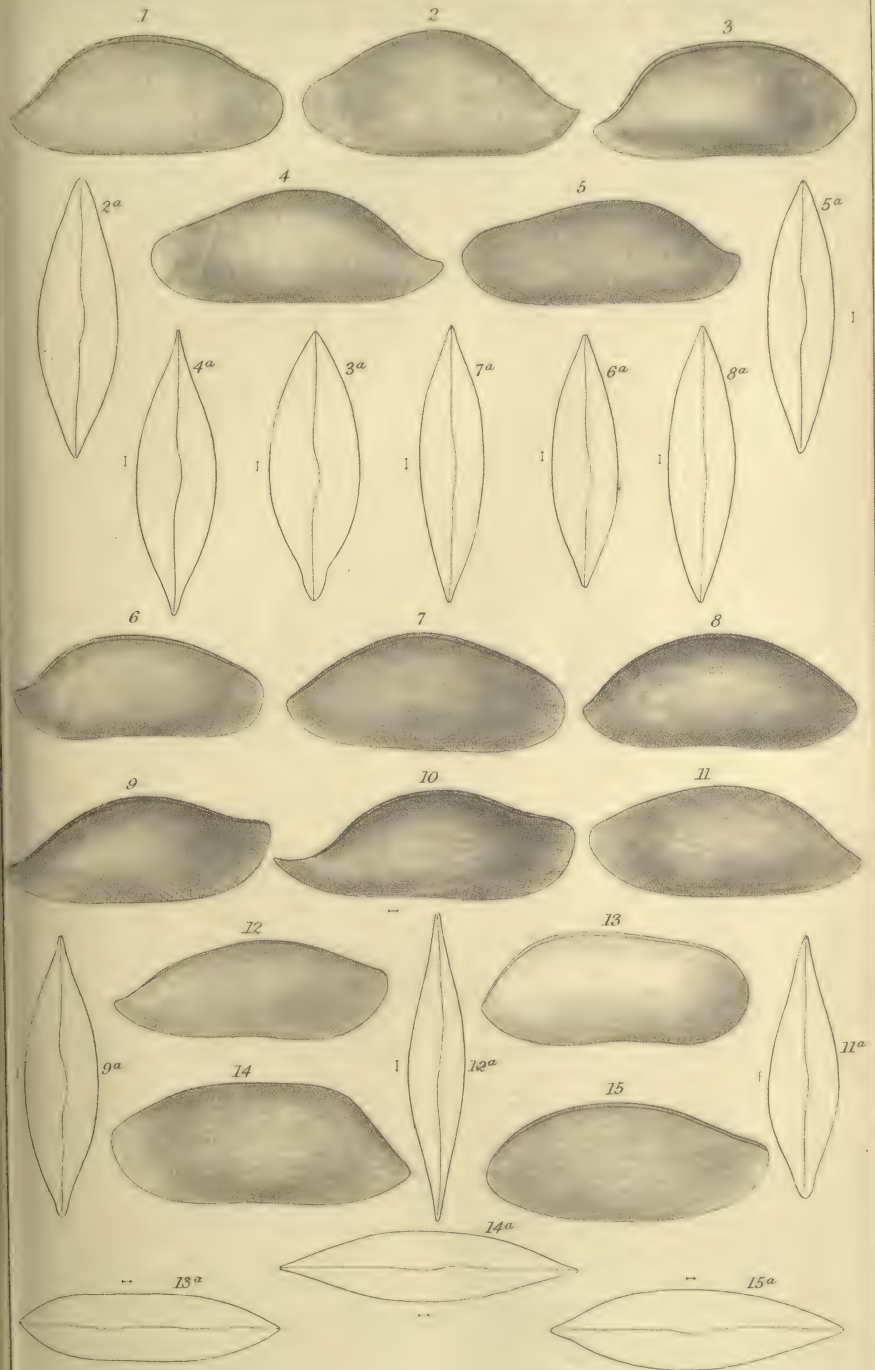
Figs. 13 & 13 a. Bairdia reniformis, n. sp.: right valve; magnified 40 times.

Figs. 14 & 14 a. Bairdia Schaurothiana, n. sp.: left valve; magnified 28 times.

Figs. 15 & 15 a. Bairdia Berniciensis, n. sp.: right valve; magnified 33 times.

[The whole of these are from the fossiliferous limestone of Tunstall Hill.]

[To be continued.]





XXXII.—*Characters of a new genus and Descriptions of three recently discovered species of Araneidea.* By JOHN BLACKWALL, F.L.S.

Tribe Octonoculina.

Family CINIFLONIDÆ.

Genus ORITHYIA, Blackw.

Eyes disposed on the anterior part of the cephalo-thorax in two transverse, slightly curved, parallel rows whose convexity is directed forwards; the intermediate eyes of the anterior row are seated on a tubercle, and, with those of the posterior row, form a trapezoid whose shortest side is in front; the anterior eye of each lateral pair is placed on a minute tubercle, and is the smallest of the eight.

Maxillæ short, straight, powerful, gradually increasing in breadth from the base to the extremity, which is truncated and somewhat produced and rounded on the inner surface.

Lip small, triangular, and pointed at the apex.

Legs long and robust, with the exception of the metatarsi and tarsi, which are disproportionally slender; the first pair is much the longest, then the fourth, and the third pair is the shortest; each metatarsus of the posterior pair is provided with a calamistrum situated on its upper surface, in a slight curve of the joint.

Spinners eight; those constituting the inferior pair are united throughout their entire length.

Orithyia Williamsii.

Length of the female $\frac{1}{4}$ th of an inch; length of the cephalo-thorax $\frac{1}{10}$; breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{8}$; length of an anterior leg $\frac{9}{16}$; length of a leg of the third pair $\frac{1}{4}$.

The cephalo-thorax is slightly compressed before, rounded on the sides, convex above, and has an indentation in the medial line; its colour is dark brown, both extremities and the lateral margins having a yellow-brown hue; it is sparingly clothed with short whitish hairs, which are most abundant in the region of the eyes. The falcæ are strong, conical, vertical, and of a red-brown colour. The maxillæ, lip, and sternum, which is heart-shaped, with small prominences on the sides, opposite to the legs, are of a yellowish-brown hue, the sternum being the darkest. The legs are provided with hairs and a few spines, and their colour is pale dull yellow, with irregular spots and annuli of a dark brown hue, the annulus at the extremity of the tibiæ being the broadest and most perfect; each tarsus is terminated

by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base. The palpi are short, and resemble the legs in colour, but are only slightly marked with brown; they have a curved and minutely pectinated claw at their extremity. The abdomen is oviform, thinly clothed with hairs, very convex above, projecting over the base of the cephalo-thorax; it is pointed towards the spinners, and has a bold conical prominence in the medial line of the upper part, at about one-third of its length from the anterior extremity; its colour is brown obscurely freckled with yellow-brown, the under part being somewhat the palest; and a fine brownish-black line, which is broadest immediately before the conical prominence, extends along the middle of the upper part; the sexual organs are moderately developed, and present two minute glossy protuberances.

I have named this very remarkable spider in compliment to Eyton Williams, Esq., of Denbigh, to whom I am obliged for it and for numerous highly interesting specimens of Arachnida and Insecta captured by him in Pernambuco. By its external structure it appears to be most nearly allied to the species belonging to the genus *Uloborus*, more especially to the *Uloborus zosis* of Walckenaer; but, as it is provided with a calamistrum and a fourth pair of spinners, which must exercise an important influence on its oeconomy, it is evident that it should occupy a place in the family *Ciniflonidae*; I have therefore proposed a new genus for its reception, to which *Uloborus zosis* may be transferred should it possess a calamistrum and a fourth pair of spinners, which I strongly suspect to be the case; indeed Walckenaer had thought of constituting a genus of it, but ultimately placed it in that of *Uloborus*.

Family THERIDIIDÆ.

Genus ARTEMA, Walck.

Artema convexa.

Length of the female $\frac{5}{16}$ ths of an inch; length of the cephalo-thorax $\frac{1}{7}$; breadth $\frac{1}{7}$; breadth of the abdomen $\frac{1}{6}$; length of an anterior leg $1\frac{9}{10}$; length of a leg of the third pair $1\frac{1}{6}$.

The legs are very long, slender, provided with hairs and fine spines, and are of a pale yellow-brown colour; a dark brown annulus occurs near the yellowish-white extremity of the femora and tibiæ, and the genual joint has a dark brown hue; the first pair is the longest, then the fourth, and the third pair is the shortest; each tarsus is terminated by three claws; the two superior ones are curved and deeply pectinated, and the inferior

one is inflected near its base. The palpi are short and of a yellowish-white hue; the radial is greatly longer than the cubital joint; and the digital joint, which tapers to a point, is without a claw at its extremity. The eyes are seated on the anterior part of the cephalo-thorax, which is rather prominent; three are grouped on each side in the form of a triangle, but not so closely as in the spiders of the genus *Pholcus*, and between these groups two smaller ones are placed transversely. The cephalo-thorax is circular, glossy, somewhat convex, with depressed lateral margins, and a large indentation in the medial line; it is of a pale yellow-brown colour, with a dark brown band extending along the middle, which is broadest in the medial indentation and bifid at its anterior extremity; a few rather obscure brown spots occur on the sides, and the middle of the long and prominent frontal margin has a brown hue. The falces are small, vertical, conical, united at the base, armed with a short, slightly curved fang, and have a single long tooth at their extremity, on the inner surface; they are of a red-brown colour. The maxillæ are long, somewhat enlarged where the palpi are inserted, slightly so towards the extremity, which is truncated on the inner side and terminates in a point; they are strongly inclined towards the lip, the extremities being in contact, and are of a yellowish-white colour. The lip is very large, diminishing in breadth towards the apex, which is somewhat pointed; its colour is yellowish-brown; the middle of its base has a brown hue, and a curved transverse line of a deeper shade, whose convexity is directed forward, occurs near its extremity. The sternum is broad, glossy, heart-shaped, with small prominences on the sides, opposite to the legs; it is of a pale yellow-brown colour, that of the posterior part being dark brown. The abdomen is short, thinly clothed with hairs, remarkably convex above, and projects over the base of the cephalo-thorax; it is of a pale yellow-brown colour, obscurely freckled with dull white; in the medial line of the upper part there is a series of large brown-black spots, and on each side of them there are oblique streaks of the same hue, which extend to the sides; the spinners, which are small, are tipped with black, and a fine black line encircles the upper part of the coccyx, on which there are two black spots placed transversely; the sexual organs are highly developed and prominent; the colour of the anterior part is dark reddish-brown, and that of the posterior part pale red-brown.

An immature male, which had to undergo its final change of integument, closely resembled the female in colour, but was rather paler and less distinctly marked.

Mr. Eyton Williams took this new species of *Artema* in Pernambuco in 1858. By the disposition of its eyes and the abso-

lute length of its legs, as compared with those of its congeners, it is closely allied to the spiders of the genus *Pholcus*, and to *Pholcus pallidus* in particular.

Tribe **Senoculina.**

Family **DYSDERIDÆ.**

Genus **DYSDERA**, Latr.

Dysdera obscura.

Length of the female $\frac{1}{3}$ rd of an inch; length of the cephalo-thorax $\frac{1}{6}$; breadth $\frac{1}{10}$; breadth of the abdomen $\frac{1}{9}$; length of an anterior leg $\frac{5}{12}$; length of a leg of the third pair $\frac{5}{16}$.

The eyes are round, pale amber-coloured, and are grouped in pairs on the anterior part of the cephalo-thorax, those of each pair being almost in contact; the lateral pairs are seated obliquely on a small tubercle, and the eyes of the intermediate pair, which are rather the smallest of the six, are in a line with the posterior eye of each lateral pair, but are separated from them by rather wide intervals. The cephalo-thorax is long, compressed before, slightly rounded on the sides, truncated in front, convex, glossy, with a small indentation in the medial line: the falces are short, conical, rather prominent, and armed with a short, slightly curved fang at the extremity, but without teeth on the inner surface. These parts are of a dark reddish-brown colour, the falces being much the darkest. The maxillæ are straight, greatly dilated at the base, where the palpi are inserted, and somewhat enlarged at the extremity: the lip is long, and truncated at the apex: the sternum, which has an oblong-oval form, is broader at its posterior than at its anterior extremity, and has small prominences on the sides, opposite to the legs. These parts have a red-brown hue, the base of the lip being the darkest, and the extremity of the maxillæ whitish. The legs are robust, provided with hairs and sessile spines, two parallel rows of the latter occurring on the inferior surface of the tibiæ and metatarsi of the first and second pairs; the first and second pairs have a red-brown hue, and there is a small black spot at the extremity of their metatarsi, on the upper side; the colour of the third and fourth pairs is dull yellow faintly tinged with red, and the small spot at the extremity of their metatarsi has a red-brown hue; the first pair is the longest, the second slightly surpasses the fourth, and the third pair is the shortest; each tarsus is terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base. The palpi are short, strong, of a red-brown hue, the radial and digital joints being

the darkest, and have a plain, curved claw at their extremity. The abdomen is short, oviform, hairy, convex above, and projects a little over the base of the cephalo-thorax; the upper part is of a sooty-brown colour; the anterior extremity, contiguous to the cephalo-thorax, the sides, under part, and spinners have a dull yellowish-white hue; the colour of the branchial opercula and tracheal stigmata is also dull yellowish-white, the former having a tinge of brown, and in the space between them there is an irregular whitish spot.

This spider, which had not arrived at maturity, was taken in Pernambuco in 1858 by Mr. Eyton Williams.

XXXIII. — *Description of two new species of Chalk Starfishes.*

By H. SEELEY, Esq.

To the Editors of the Annals and Magazine of Natural History.

GENTLEMEN,

45 Great Ormond Street, Sept. 3, 1858.

The fragmentary condition of the specimens described might seem to render the accuracy of the descriptions doubtful; but no one can doubt that the essential specific characters of a *Goniaster* are nearly as well exemplified in a single side as they would be in a whole Starfish, the only danger being that in specimens so imperfect you might have an abnormal form, a monstrosity, or a made-up fossil: but all these possibilities have been fully discussed, and the subjects of them submitted to an exceedingly careful examination, the result of which has been that the evidences of both specimens being new species have so increased, that it would be useless longer to delay their publication. Neither species is likely to be mistaken for any yet described.

Truly yours,

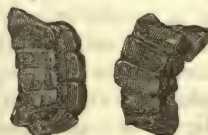
HENRY SEELEY,

Hon. Sec. to the Museum, W.M.C.

Goniaster (Goniodiscus) Forbesii, S.

Body? Sides very gently curved outwards. It has two oblong, convex, rather swollen superior intermediate marginal plates, each bearing two rows of laterally-oblong, proportionately large protuberances. The inner edge of the ossicles is slightly rabbeted; this appears to the naked eye as possibly caused by the two protuberances there placed being greatly developed; but a lens shows the margin as a flat field, out of which the cushioned

Upper. Under.



surface, bearing the hill-like prominences, rises. The superior oculars are greatly developed, and more swollen than the intermediate bones; they are one and a half times as large as the latter, and, in size and shape, look as though formed of an ordinary marginal and the half of another divided diagonally; they carry three rows of prominences, and have a rabbet on the inner edge similar to that on the others. The superior plates are steep and deep, compared with the inferior plates, over which they slightly project, so that when the under surface is seen, the margin appears step-like. The under-plates on a side were in all six in number, one being under each intermediate marginal, and two under each of the eye-plates; they are flat, smooth, and rounded-off at their outer edge. The margin of each inferior ossicle is bordered by a slight rabbet, the walls of which are connected by a number of partitions which give it the look of a line of little pits. The fragment consists of one complete side, wanting only a terminal inferior ocular plate. It measures in length $\frac{5}{8}$ ths of an inch.

This species is easily distinguished from every other by the number of its superior marginals. In size it comes nearest to *rugatus*, Forbes, which it is not unlike in the markings on its dorsal marginal ossicles.

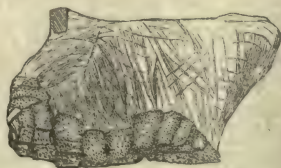
Chalk of Hertford.

Goniaster (Goniodiscus) Furnivalli, S.

Body pentagonal, with sides gently curved outwards. When perfect, having on the dorsal surface, in each side, ten oblong, convex, rather finely-granulated marginal ossicles, all steep or abrupt, and deep. Of these the oculars are not preserved, but must have been small and triangular, and have projected slightly over the inferiors. Of the four intermediate marginals the two middle ones are slightly the shorter; this arises from the inner side of the outer intermediate marginals sloping towards the outer side, and so, with the ossicles between, forming a gentle curve; but all four are of the same width, and rather wider than the others. The inferior ossicles are eight, flat, finely punctate, all of nearly the same width (the two middle being slightly



Under surface.



Upper surface.

the narrowest), broader than the superior, and slightly concave at the meeting of the two exposed sides. The inferior eye-plates are wedge-shaped. Ossicles of inferior (?) surface of disk punctate. Length of a side $1\frac{1}{4}$ inch.

This species is well distinguished from every other unmarginated form, except *rectilineus*, M'Coy, by its finely-granulated superior marginals; and from that, to which it approaches nearest, by the punctations on its inferior plates, and by its wedge-shaped inferior oculars. About the size of *uncatus*.

Chalk of Gravesend.

Both specimens are in the Collection of the London Working Men's College, Great Ormond Street.

XXXIV.—On a new genus of European Coleoptera.

By T. VERNON WOLLASTON, M.A., F.L.S.

Fam. Melyridæ.

Genus ANTIDIPNIS.

Corpus minutum, ovatum, in utroque sexu (nisi fallor) apterum : *capite* antice angustato, *clypeo* brevi membranaceo; *oculis* prominentibus. *Antennæ* longe ante oculos insertæ, filiformes, distincte 11-articulatæ; articulo 1^{mo} reliquis longiore, paulo robustiore, leviter subclavato; 2^{do} brevi; inde ad decimum longitudine subæqualibus; 11^{mo} ovato. *Labrum* transversum, antice truncatum, apicem versus membranaceum. *Mandibulæ* triangulares, corneæ, basi latæ, apice incurvæ acutæ, necnon (in unâ saltem) fissæ. *Maxillæ* bilobæ; *lobis* membranaceis, apice obtusis pubescentibus. *Palpi maxillares* in sexu masculo valde diversi quam in fœmineo: in *maribus* longissimi (fere articulum antennarum septimum attingentes), articulo 1^{mo} minuto, 2^{do} huic paulo crassiore elongato, 3^{tio} 4^{to}que maximis valde incrassatis (illo ovato apice truncato, superne intra apicem externum eroso, hoc inæquali subquadrato, ad apicem ipsum spongioso); in *fœminis* multo breviores (haud ultra articulum antennarum tertium extendentes), articulo 1^{mo} minuto, 2^{do} 3^{tio}que huic paulo crassioribus (hoc illo vix brevior), 4^{to} elongato (2^{di} 3^{tii}que conjunctim longitudine æquali), leviter crassiore, fusiformi. *Palpi labiales* in utroque sexu fusiformes; articulo 1^{mo} parvo, 2^{do} longiore crassiore, subclavato apice truncato, ultimo huic longitudine subæquali sed paulo tenuiore, fusiformi basi truncato. *Ligula* a me vix distincte observata. *Pedes* longiusculi, graciles, valde cursorii: *tibiis* ecalcaratis, *posticis* basi leviter subcurvatis: *tarsis* elongatis filiformibus, articulo 1^{mo} longiusculo, *anticis* in sexu masculo 4-articulatis: *unguiculis* simplicibus.

Ab ἀντί pro, et δειπνον cœna (sc. cœnæ loco).

The curious little beetle from which the above generic characters have been compiled was captured by myself, near Lisbon, on the 17th of last July, in *stercore arido humano* (a somewhat remarkable habitat for a Malachian, and one I suppose which it must

have taken to as a last resource, everything in the surrounding country being completely burnt up), on the low maritime hills above Bellem. Believing it, at the time, to constitute the type of a new genus, I have transmitted it, since my return, to Dr. Schaum of Berlin; and he agrees with me in regarding it as allied to *Colotes* of Erichson, but unquestionably distinct. It is apparently the *Colotes rubripes* of Jacquelin-Duval (published in the 10th volume of the French Annales, New Series). At any rate, it agrees exactly, except in structural details, with the insect there described; and I may add that I have received from M. Dert of Bordeaux the *selfsame species as my own*, under the name of "*Colotes rubripes*, Jac.-Duval," and, moreover, taken at La Teste beneath dry sea-weed,—thus coming from the actual locality, and captured under precisely similar circumstances, as those from which M. Duval's diagnosis was drawn out. I conclude, therefore, without the slightest hesitation, that my Lisbon insect and M. Jacquelin-Duval's are, even specifically, identical.

But, now, as regards the genus, it is quite clear—unless indeed (which is not at all likely) M. Dert's insect from La Teste was wrongly referred to the *Colotes rubripes*—that M. Duval was entirely mistaken in identifying it with *Colotes* of Erichson, from the published characters of which (*vide* 'Entomographien,' p. 129) it presents abundant and most obvious differences. If, however, M. Duval did really examine the two sexes, which he professes to have done, it is an anomaly how he could possibly have overlooked the extraordinary distinctive characters of the maxillary palpi of the males: whilst, on the other hand, if he possessed *only* the males—which I believe to be the case, for he expressly mentions the largely-developed terminal joint of those organs in the six individuals he described from (though he gives it the wrong shape, and says nothing about the penultimate one being also equally enlarged, thus forcing the insect, as it were, into Erichson's *Colotes*, at the expense of facts)—it is no less mysterious how he could have seen five joints in the front tarsi of *any* of his specimens, for (being all males) they could only have had four. Thus, if I am right in my premises—viz. that M. Dert's insect was correctly determined (which, judging from the description of *Colotes rubripes*, and its exact locality and habits, I believe to be the case)—it appears pretty evident that M. Duval had only males to work from (for, otherwise, *how could he have overlooked the wonderful differences of palpi?*), and that therefore, in order to gain them admission into *Colotes*, he must, in the first place, have merely *imagined* the anterior feet of some of his examples to be pentamerous, and must, secondly, have altogether *ignored* the marvellous dilatation of the *penultimate* joint of their maxillary palpi!

Be this, however, as it may, it will be sufficient to state that the present insect differs, in its structural details, from *Colotes* (judging from the diagnosis of that genus as given in the 'Entomographien'), first and foremost, in the immense development of the maxillary palpi of the males. Thus, whilst in *Colotes* the first and third joints are (according to Erichson) small, in *Antidipnis* the first only is small, the third being in the male sex enormous, and even in the female scarcely shorter than the second. Then, the fourth (according to the same author) is, in both sexes, strongly hatchet-shaped, whereas in the present genus it is securiform in neither, being in the males immensely enlarged (like the penultimate one) and *subquadrate* (with the apex spongiose), and in the females not much thicker than the one before it, but elongated and strictly *fusiform*. Moreover, the very great difference in the entire length of the maxillary palpi in the two sexes (they being twice as long in the males as they are in the females) should be especially noticed. These wonderful sexual differences of the palpi (so anomalous in the *Melyridæ*) will be more than sufficient, even of themselves, to establish *Antidipnis* as a new and interesting genus; nevertheless minor characters, likewise, are not wanting. Thus, the basal joint of its antennæ is apparently less thickened, and the second one shorter, than is the case in *Colotes*. In *Colotes*, too, Erichson states that the first and second joints of the feet are of equal length, whereas in *Antidipnis* the basal one (in both sexes, and in all the feet) is longer than the second.

Although the *specific* characters have been accurately described by M. Duval, I subjoin the following diagnosis, as it is just within the range of possibility that M. Dert's insect may, after all, have been wrongly identified, and that so his species and mine (which are certainly the same) may be new. In that case, I would propose for it the trivial name of *palpalis*; but, as already stated, I regard such a contingency as most improbable. I would therefore record it thus:—

Antidipnis rubripes.

Ebæus rubripes, Perris, ined.

Colotes rubripes, Jacq.-Duv., Ann. de la Soc. Ent. de France (2ième série), x. 707 (1852).

A. piceo-niger nitidulus, ore, antennis pedibusque rufo-testaceis; capite prothoraceque minute (oculo armato) punctulatis et densissime subtilissimeque alutaceis; elytris densius et rugose punctatis et pube depressa albida parce irroratis. Long. corp. lin. $\frac{7}{8}$ –1.

Habitat in stercore arido humano, a meipso prope urbem Ulyssiponensem, mense Julio A.D. 1858, sat copiose repertus.

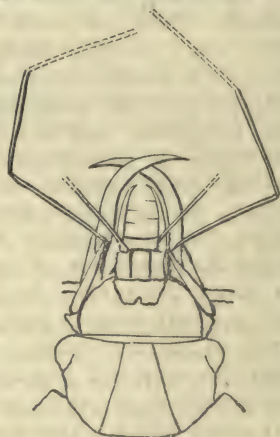
XXXV.—*List of Coleoptera received from Old Calabar, on the West Coast of Africa.* By ANDREW MURRAY, Edinburgh.

[Continued from vol. i. ser. 3. p. 135.]

Chlæniidæ (continued).

ECTENOGNATHUS, mihi (ἐκτενῆς and γνάθος).

Mentum dente medio simplice. Palpi tenues, elongati et subcylindrici (articulis ultimis adhuc ignotis). Mandibuli valde projecti, elongati, fortiter arcuati et apice acutissimo. Maxillæ spinis paucis armatæ. Labrum subquadratum, postice parum angustatum, levissime emarginatum. Antennæ filiformes, articulo tertio cæteris longiore. Prothorax subcordatus, antice emarginatus, postice truncatus, margine reflexo. Elytra prothorace latiora, quadrato-ovalia, parum convexa. Tarsi marium ignoti, fœminarum ut in cæteris generibus *Chlæniidarum*.

1. *E. Dryptoides*, mihi.

Supra nigro-virens et satis opacus, subtus niger et politus; capite antice ore, gula, suturæ apice et pedibus testaceis; capite postice leviter granuloso, antice impunctato; thorace fortiter et dense punctato, margine late et profunde reflexo; elytris opacis, leviter punctato-striatis, interstitiis transversim papillose punctatis atque transversim levissime aciculatis; subtus prosterno leviter punctato, mesosterno et metasterno fortiter punctatis.

Long. $6\frac{1}{2}$ lin., lat. $2\frac{1}{2}$ lin.

Rather narrow; greenish black and opaque above, black and polished below; the anterior part of the head, the basal joint of the antennæ, the parts of the mouth, the throat, the extreme margins of the sides of the thorax, the reflexed margin of the elytra, particularly towards the apex, and a narrow margin on their sides and suture near their apex, and the legs, testaceous. Head finely granulose behind, smoother on the vertex, which is somewhat raised; front smooth and impunctate, with a transverse shallow depression in the middle opposite the anterior part of the eyes, an irregular depression and some granulose punctures on each side close to the base of the antennæ; the

greenish colour of the head advances in the centre as far forward as the front of the eyes, but the testaceous colour passes backward on each side as far as the middle of the eye; the apex of the mandibles and of the joints of the palpi is darker than the rest; clypeus rather broad; labrum quadrate, somewhat broadest in front, with a large shallow depression in the centre (but I am doubtful whether this is not owing to an accidental crushing in my specimen); antennæ dark fuscous, the basal joint, and possibly the second, which is the shortest, more or less testaceous; eyes moderately prominent. Thorax subcordate, not without resemblance to the thorax in *Agonum*, coarsely and granulosely punctate, so as to appear opaque; margins rather broadly reflexed, especially behind, with their edges narrowly semitranslucent and testaceous; dorsal line well marked, but reaching neither to the front nor back; a depression across the base, and a sinuate fovea on each side within the reflexed margin, deepest and widest behind, following the outline of the margin for two-thirds of the length of the thorax. Scutellum small, triangular, finely granulose, elongate-oval, somewhat quadrate towards the shoulders and apex. Elytra opaque, flattish on the disk, convex on the sides and apex, punctate-striate, the striæ and punctures fine; the interstices flat, transversely rugosely punctate, giving the appearance of the elytra in *Drypta*; under a powerful lens, the rugosity of the punctation is seen to be caused by the punctures having been made as it were from behind, so that in front of each there is a slight papillose elevation: besides this punctation, there is a very fine transverse aciculation; and there is a fine short pubescence proceeding from the punctures along the sides, which probably in fresh examples will extend over the whole elytra; the scutellar stria extends nearly a fourth of the length of the elytra, and the narrow edging of testaceous along the suture at the apex, which scarcely goes beyond the first stria, extends forwards about the same length. Under side polished, shining; prosternum very sparingly and faintly punctate; mesosternum and metasternum roughly and rather closely punctate; segments of abdomen faintly rugose, particularly at the sides.

I have only received a single specimen of this interesting species, and, unfortunately, the last joints both of the palpi and antennæ are wanting; but there remain sufficient characters of generic importance to enable me to allot it a place as a new genus of the *Chlenniidae*.

OODES, Bon.

1. *O. obesus*, mihi.

Latus, convexus, niger, subnitidus, impunctatus, lævis; antennis

palpisque piceis; mandibulis piceis, planis, margine exteriori reflexo; thorace marginibus (præcipue antice) depressis, linea sublaterali arcuata; elytris punctato-striatis, interstitiis convexis; tarsis piceis, anticis pallidioribus.

Long $5\frac{1}{2}$ lin., lat. $3\frac{1}{2}$ lin.

Broad and convex; black, smooth, and impunctate, with a dull, somewhat silky lustre, occasioned by a very fine aciculated punctation, scarcely visible except under the compound microscope. Head smooth, with a slight depression along the front, and with two small pits between the eyes; middle tooth of the mentum with a tendency to become bifid; antennæ piceous, first three joints shining, the rest pubescent and more dusky; palpi piceous; mandibles piceous, flat, rather thin, circular exteriorly, straight interiorly, except at the point, which has a rounded tooth; exterior margin slightly raised and reflexed posteriorly; clypeus slightly emarginate, with a deep square depression in the middle of the anterior margin, and two large foveæ in each of the anterior angles. Thorax convex, without marginal line, except a very faint one on each side in front, with a linear depression from each anterior angle reaching almost to the basal margin, curved inwards, deepest in front, and leaving a broad marginal space widest behind: the appearance of this line reminds one of a bridle lying on the neck of a horse; it is, however, very faintly recurved near the base: dorsal line faint, reaching neither to the anterior nor basal margins. Scutellum large. Elytra punctate-striate; interstices convex; the short scutellar stria along with the sutural stria converging to meet the third and fourth striæ at the base; the second stria straight; the striæ deepest towards the apex, which is slightly sinuate. Under side with the episterna and sides of the metasternum punctate; sides of abdomen slightly punctate; the prosternum slightly prolonged behind, with the prolongation margined. Tibiæ short; anterior tibiæ broad and triangular; anterior tarsi piceous, in the male with the first three joints very broad and transverse, and the fourth very small.

The most striking character in this species is the form of the mandibles and the projecting prosternum; the former might perhaps justify its establishment as a subgenus, and the latter would seem to approach it to the genus *Lonchosternus* of Laferté, of which the only character differentiating it from *Oodes* is the prosternum prolonged as in *Hydrophilus*. The projection here has no pretensions to such an extensive prolongation, but it may be viewed as the passage leading to it. The species is readily recognized by these characters, and by the bridle-shaped depression on the thorax.

2. *O. politus*, mihi.

Niger, nitidus, impunctatus, politus; antennis fuscis, ad basin ferrugineis; mandibulis ferrugineis, acutis, supra haud convexis; capite et thorace lævissimis, hoc stria marginali tenui laterali et anteriori; elytris politis, leviter striato-punctatis, interstitiis planis, spatio marginali opaco, ad apicem latiore. Long. $4\frac{1}{2}$ lin., lat. 3 lin.

Black, shining, impunctate, and polished. Head smooth, with scarcely any depressions; antennæ with the first three joints ferruginous, rest dusky; palpi piceous; terminal joint of maxillary palpi elongate and ovato-cylindric (rest wanting in my specimen); mandibles ferruginous, darker at tip, not convex, triangular, making the muzzle sharp, nearly straight on the outer side, slightly curved and without teeth on the inner; clypeus large, transverse, scarcely emarginate; mentum with a strong middle tooth, and the lateral lobes large, acute, and with a conical outline; ligula as in the rest of the *Chlœniidæ*, free at its extremity, and cut straight. Thorax smooth, convex, and with a faint thin stria along the lateral and anterior margins, none on the basal. Scutellum rather large. Elytra delicately punctate-striate; interstices flat and shining; the scutellar stria along with the first and second converging at the base to meet the fourth, the third straight; a marked opake and rugose marginal space surrounding the sides and apex of the elytra, widest at the apex; the margin of the rest of the elytra touching this space sharply defined, so that the polished disk seems to lie on the top of an under opake layer; the apex slightly sinuate. Under side with scattered punctures, except along the middle; the prosternum somewhat projecting and slightly grooved, as in last species. Legs piceous (the anterior legs are wanting in my specimen).

I have only received one imperfect specimen of this species; and the want of its anterior legs, combined with the somewhat different form of the mentum and terminal joint of the palpi, prevent me referring it with absolute certainty to this family; but I have no doubt, from its general facies, taken along with the other characters which remain, that I have placed it correctly.

Cratoceridæ.

DIATYPUS, mihi.

(From *διατυπώ*, alluding to its being the representative in Africa of the genera *Daptus*, *Geopinus*, *Agonoderus*, &c.)

Mentum breve, profunde emarginatum, dente medio curto et obtuso, lobis lateralibus latis, fortiter extus rotundatis. Ligula parva, ad basin coarctata, ad apicem truncata. Paraglossæ

dilatata, rotundata. Articulus ultimus palporum maxillarum ad basin cylindricus, in medio tumidus, ad apicem acuminatus; articulus ultimus palporum labialium similis, sed minus tumidus et minus acuminatus et truncatus. Mandibuli fortes, densi, dexter intus bidenticulatus, sinister unidenticulatus. Labrum quadratum. Caput mediocre, haud retro coarctatum. Oculi satis prominentes. Antennæ ad instar capitis et prothoracis longitudine; articuli primus, tertius et quartus longitudine æquales, cæteris longiores, et, cum secundo (breviore), obconici, quintus et sequentes parum depressi. Prothorax subquadratus, parum retro coarctatus; anguli antice rotundati, postice distincti. Elytra prothorace paullo latiora, parum elongata, parallela, ad apicem sinuata. Pedes mediores: tibiæ anteriores parum dilatatae et versus apicem extus denticulatae; tibiæ intermediae et posteriores haud denticulatae; tarsi subtus fortiter ciliati, anteriores et intermedii maribus dilatati, articulis quatuor primis triangularibus, primo longiore, quarto bilobato in omnibus tarsis, posterioribus haud dilatatis. Corpus satis elongatum.

In general appearance the species composing this genus approach nearer to the American genus *Geopinus* than to any other which I have seen, but are readily distinguished from it by the possession of a median tooth to the mentum, besides the other characters above mentioned; their form also is less convex, and approaches more nearly to *Anisodactylus*. The place of the genus seems to be next to Dejean's and Schmidt-Goebel's Indian genus *Batoscelis*, as defined by Lacordaire, from which it differs in the following respects:—its mentum is deeply, instead of being feebly emarginate; its ligula is small, instead of being "assez grande;" its paraglossæ are rounded instead of being truncate, and can scarcely be called arched. In other respects the characters seem almost the same. The bilobed fourth joint of the tarsi is not noticed in Lacordaire's description. Probably it would have been better for me to have widened the characters of the genus *Batoscelis*, so as to have admitted the following species, instead of making a new genus for them; but the difference of their native country has induced me to separate them.

1. *D. Dohrnii*, mihi.

Fusco-virescens; antennis, clypeo, mandibulis palpisque ferrugineis; capite polito, foveis duabus inter oculos linea antica transversa junctis; thorace leviter marginato, lateribus depressis, angulis posticis foveolatis, disco leviter, lateribus fortius punctato; scutello impresso; elytris levissime punctatis, striatis, striis impunctatis, interstitiis leviter convexis; subtus

fuscus, lateribus (episternis et epimeris) leviter et irregulariter punctatis, medio et abdomine impunctatis; pedibus pallidis. Long. 5 lin., lat. $2\frac{1}{4}$ lin.

Above fuscous with a virescent tinge. Head polished and sparingly punctate behind the eyes, the rest impunctate, or nearly so; a deep angular fovea on each side near the inner corner of the eyes, united by a deep impunctate transverse line, in front of which the epistome is marked by a broad, transverse, somewhat rugose depression; antennæ, clypeus, palpi, and parts of the mouth more or less ferruginous; clypeus with a row of depressions in front, from each of which springs a hair. Thorax rather convex, with a broad well-defined depression along the margins and angles, broadest at the posterior angles, and bordered all round with a slight raised edging; slightly punctate on the disk, more deeply so on the depressed margins; the dorsal line is feebly punctate-striate, and reaches only to the anterior semilunar depression, which is well marked; the base is very slightly but broadly emarginate; in front of the emargination is a sinuate transverse depression, on each side of which is a fovea; the anterior angles are broadly rounded, the posterior are obtuse. Scutellum ferrugineo-fuscous, rugosely impressed. Elytra with a greater virescence than the head and thorax, very faintly punctate; striate, but without punctuation in the striæ; the interstices slightly convex; two or three slight foveæ on the outer side of the second stria, one about a third from the base, the next about a third from the apex, and the last about a sixth from the apex; a number of pits are placed at irregular distances along the marginal space. Under side fuscous, paler than above, and not virescent; the middle and the abdomen are not punctate, but the side-pieces (episterna and epimera) are all faintly and irregularly punctate. The legs are pale testaceous.

I have named this species after Herr Dohrn of Stettin, an entomologist of world-wide reputation, whose great attainments as a man of science are only equalled by his genial and endearing qualities as a friend.

2. *D. Smithii*, mihi.

Præcedenti similis, sed major; niger et haud virescens; capite linea transversa antice multo minus profunda; thorace disco impunctato, angulis posticis minus obtusis, ad mucronem fere rectis; elytris interstitiis impunctatis, striis profundioribus quam in *D. Dohrnii*; subtus vix punctatus; cæteris ut in *D. Dohrnii*.

Long. 6 lin., lat. $2\frac{1}{2}$ lin.

Closely allied to the preceding, but differs from it in the fol-

lowing particulars. It is black instead of virescent fuscous. The head is wholly impunctate; the angular depressions in front are shallow, and united by a faint transverse line instead of a deep groove, and the epistome has scarcely any depression. The thorax is impunctate on the disk; the dorsal line is scarcely punctate, and it reaches wholly to the front, the posterior angles are less obtuse than in *D. Dohrnii*, and somewhat sinuate, so as at the very point to be almost right-angled for a short space. The elytra are more deeply striate, and the interstices more convex and impunctate. The under side has scarcely any punctation at all, either on the sides or middle. In other respects the same description will apply to the two species.

I have named this species after my friend Mr. Frederick Smith of the British Museum, whose kindness places the extensive information he possesses at the disposal of all who desire to profit by it.

Anisodactylidæ.

ORTHOGONIUS, Dej.*

1. *O. rugiceps*, mihi.

Latus, depressus, niger, subnitidus; antennis, palpis, abdomine tarsisque piceis; capite punctato-rugoso, bi-impresso; thorace leviter et sparsim transversim rugoso, interstitiis levissime et perparce punctato, sine punctis majoribus in rugis; elytris lepidissime et subtilissime transversim aciculatis, striato-punctatis, interstitiis parum convexis, hic et illic leviter punctatis; subtus subopacus; abdomine subtiliter aciculato, præcipue lateribus.

Long. 8 lin., lat. $3\frac{1}{2}$ lin.

Depressed, broad, black, with something of a silky gloss. Head rugosely punctate, with two longitudinal depressions between the antennæ united by a transverse line; antennæ, palpi, and parts of the mouth piceous. Thorax transversely rugose, lightly and sparsely on the disk, more coarsely on the depressed sides and base, the spaces between the rugosities on the disk faintly and sparingly punctate, no larger punctures in the rugæ;

* Notwithstanding the high authority of M. Lacordaire, to which I have deferred for the sake of uniformity, I cannot bring myself to think that this is the proper position of this genus. Sometimes trifling distinctions, which are yet found constant in a group, help one to discover the true affinities of a species when more prominent characters fail. In this instance the pectination of the claws of the tarsi, the acicular microscopic sculpture on the elytra, along with their truncation, lead me to look for the proper place of the genus in the neighbourhood of *Calathus*, *Pristonychus*, &c., in which exactly the same characters are found.

a triangular fovea on each side of the base united by a somewhat bisinuate transverse line; dorsal line distinct, reaching from this basal line to the anterior margin; semilunar depression in front distinct and somewhat triangular, not more punctate or rugose than the neighbouring parts; posterior angles obtuse, not rounded, approaching a right angle at the very point for a very short space. Scutellum rather elongate, impunctate. Elytra broader than the thorax, two and a half times the length of the thorax; shoulders prominent, marked with the finest transverse aciculations, which are not visible except under a powerful magnifying glass; punctate-striate; the interstices sparingly and faintly punctate here and there; slightly convex, wider at the base than the apex, the space between the third and fourth and fifth and sixth striæ widest, the latter with a rugose marking at the base; the marginal space wide, widest towards the apex. The under side of the body black, impunctate; abdomen dark piceous, with a silky opaque lustre; more strongly aciculate than the elytra. Thighs with papillary punctures along the sides and near the joint; tibiæ and tarsi dark piceous.

This species seems to come nearest to Hope's *O. latus*, or his *O. longipennis*, described in these 'Annals,' 1st series, vol. x. p. 92; but the somewhat larger size, and the sulcation of the elytra, instead of striation, with the deep punctation of the sulci, "sulcis fortissime punctatis," which he gives as a character of the former, sufficiently distinguish it from this species; and the relative proportions of the elytra and thorax in *O. longipennis*, the former being stated at four times the length of the latter, prevent its being confounded with this, which has the elytra only two and a half times the length of the thorax.

2. *O. Clarkii*, mihi.

Niger vel nigro-piceus, nitidus, præcedente angustior et convexior; antennis trophisque, corpore subtus pedibusque ferrugineo-piceis; capite sparsim profunde punctato, bi-impresso ut in *O. rugicipite*; thorace fere ut in *O. rugicipite*, sed lævior et cum punctis sat profundis in rugis positis; elytris multo minus distincte aciculatis quam in *O. rugicipite*, minus profunde striato-punctatis, interstitiis fere planis, sparsim punctatis præcipue lateribus et apice, et cum lepidis lineis hic et illic irregulariter transversim ductis; subtus ut in *O. rugicipite*, sed episternis metathoracicis oblique rugosis; femoribus pallidioribus.

Long. $7\frac{1}{2}$ —8 lin., lat. 3 lin.

Black or dark piceous, shining, narrower and more convex than *O. rugiceps*. Head not rugose, but covered with large, deep, scattered punctures; an angular depression united by a trans-

verse groove between the antennæ. Thorax nearly as in *O. rugiceps*, but smoother and with a few large punctures irregularly dispersed in the wrinkles or scratches which extend irregularly over the disk, but principally in a transverse direction; the dorsal line is well marked, but does not reach to the anterior margin; posterior angles obtuse. Elytra three times the length of the thorax, broader than the thorax, but not so much so as in *O. rugiceps*; much more finely aciculated than in that species, so that they are more shining and have less of a silky gloss; they are less deeply punctate-striate; the interstices almost flat, sparsely punctate, but more closely and deeply towards the sides and apex; these punctures are larger than the similar ones in *O. rugiceps*; there are also a number of delicate scratches or wrinkles, which extend here and there more or less transversely or obliquely across the different interstices; the space between the sixth and seventh striæ is narrowest, widening a little towards the base, and more so towards the apex; in other respects nearly as in *O. rugiceps*. The under side is ferrugineo-piceous, the sides of the body with an occasional puncture, and the meta-thoracic episterna deeply wrinkled obliquely; the abdomen very finely aciculated, with two punctures on each segment in the middle and two on each side. Legs dark piceous, thighs lighter.

I have named this species after my able and amiable friend, well known to all British entomologists, the Rev. Hamlet Clarke.

3. *O. pinguis*, mihi.

Latus, niger, nitidus; antennis, trophis, corpore subtus pedibusque ferrugineo-piceis; capitis vertice et fronte profunde punctatis; thorace ut in *O. Clarkii*, sed rugis magis reticulatis, linea dorsali profunda; scutello polito; elytris lepidissime aciculatis, leviter striato-punctatis, interstitiis fere impunctatis sed sparsim et leviter punctatis inter strias quintas et sextas, sine lineis transversis lepidis; subtus politus; abdomine fere ut in *O. Clarkii*.

Long. $5\frac{1}{2}$ lin., lat. $2\frac{3}{4}$ lin.

Broader for its size than either of the two preceding species; black, shining. Head coarsely and deeply punctate on the vertex and in front, not punctate on the sides behind the eyes; a somewhat quadrate smooth patch also in front in the centre behind the epistome; a fovea on each side in front, between which is a transverse line, which forms the anterior margin of the smooth space; in front of this line is the epistome, which is impunctate, except by four deep punctures in a transverse groove which traverses it; antennæ and parts of the mouth ferrugineo-piceous. Thorax nearly as in *O. Clarkii*, except that the wrinkles are not so

transverse as in it, some of them running longitudinally or obliquely, so as in parts to form faint wide-meshed reticulations; the dorsal line is rather deeper, and reaches to the anterior margin. Scutellum polished. Elytra nearly three times the length of the thorax; very delicately aciculated, though scarcely so finely as in *O. Clarkii*; finely punctate-striate; the interstices without the transverse scratches which occur in *O. Clarkii*; with scarcely a single faint puncture, except on the interstice between the fifth and sixth striæ; the interstices somewhat convex, especially towards the sides, where the striæ are deepest; the space between the sixth and seventh striæ narrowest, and nearly as in *O. Clarkii*, but almost without any widening at the base. Below ferrugineo-piceous; some faint scratches on the episterna, but nothing like the deep oblique wrinkles on the metathoracic episternum in *O. Clarkii*; abdomen nearly as in it. Legs ferrugineo-piceous; thighs rather paler.

This species comes near Dejean's description of *O. brevithorax*; but the latter is described as having the interstices on the elytra all punctate, which is certainly not the case here.

XXXVI.—On *Phyllangia*, a new living British Madrepora.

By PHILIP H. GOSSE, F.R.S.

To the Editors of the *Annals of Natural History*.

GENTLEMEN,

With much pleasure I announce the discovery of an interesting living Madrepora, new to the European seas, if not new to science.

About six weeks ago, Mr. G. H. King, of this town, dredging in Weymouth Bay, brought up a piece of the bottom, about a foot square, evidently the edge of one of the oolite ledges, torn off by the dredge. On this were from fifty to a hundred specimens of a little Madrepora, which was considered to be our common *Cyathina Smithii*. The group was broken up and dispersed; but a fragment having fallen under my notice, I immediately saw in it characters which distinguished it from *Cyathina*.

It proves to be of the genus *Phyllangia* of Milne-Edwards (*Hist. Nat. des Corallaires*), and agrees in the most minute particulars (with one or two slight exceptions) with the *P. americana* of the same author.

The exceptions are—1st. That whereas *P. americana* is described and figured as reaching half an inch in diameter, none of the specimens procured at Weymouth attained (as I was told) quite half those dimensions, those which fell under my own notice not exceeding one-sixth of an inch. 2ndly. That whereas

in *P. americana* the summits of the primary septa are described as arched, in our Weymouth specimen that character exists only in some of them, others, of the same cycle, being obliquely truncate, the outer part being the higher.

These differences are too slight to constitute distinction of species; and hence I conclude that we have on our southern coasts a *Phyllangia* now living, in some abundance, which has hitherto been recognized only as inhabiting the Caribbean Sea.

I was not so fortunate as to see the animal alive, my specimen, though in the flesh, being in an advanced state of decomposition when I obtained it; but Mr. King, who is familiar with *Cyathina Smithii*, speaks of the living *Phyllangia* as having a general resemblance to that species, and tells me that he observed white and green hues. He noticed numerous tentacles, but did not observe whether they were knobbed.

It may be fairly expected that more specimens will be obtained of this interesting little Coral; and to facilitate the search for it, I may mention that this colony was taken just under White-nose.

The following diagnosis may assist in its recognition:—

MADREPORARIA.

Tegumentary structure solidified so as to form a proper corallum.

APORA.

Visceral chamber free, or subdivided transversely by irregular projections. Septa well developed. Sclerenchyma compact.

Astræidæ.

Intersepts more or less divided transversely by projecting plates. Visceral cavity not obliterated, but only subdivided. No cœnenchyma. Walls imperforate.

ASTRÆINA.

Septa toothed.

ASTRANGIACEÆ.

Increasing by buds, which spring from stolons, or from creeping basal expansions. Polypary always remaining very short.

Phyllangia.

Wall naked, ribbed. No false cœnenchyma. Primary septa with the upper edge untoothed. Columella rudimentary.

P. americana. Four cycles of septa. Primary septa with the outline of their summits arched.

May I be permitted to add that if any naturalist, under whose eye this notice may fall, possesses, or should at any future time possess, a living specimen of this *Madrepore*, I should esteem it a particular favour to be allowed an opportunity of figuring it in my '*Actinologia Britannica*.'

I am, Gentlemen,

Yours respectfully,

P. H. Gosse.

Sandhurst, Torquay, Oct. 20, 1858.

XXXVII.—On *Arctium*. By CHARLES C. BABINGTON, M.A.,
F.R.S. &c.

At the Meeting of German Naturalists in 1857, Herr Candidat Nitzchke made a communication concerning the genus *Lappa* of Tournefort; and as he takes especial notice of my paper upon *Arctium* (A. N. H. ser. 2. xvii. 369), some reference to it seems desirable. He informs us that *L. major*, *L. minor*, and *L. tomentosa* are usually distinguished in Germany, and also that the *L. intermedia* of Lange has been observed several times, and does not seem to be scarce in Silesia. He arrives at the opinion that the three first-named are true species, but that there are frequent hybrids between them, such as *L. minor-tomentosa*, corresponding with my *A. pubens*, and *L. major-minor*, synonymous with Lange's *A. intermedium*. He gives no proof of the fact, except that the plants are often found in each other's company. Unfortunately there is a tendency amongst German botanists to declare everything a hybrid which is of difficult determination and nearly allied to other species. Agreeing with Fries, and with the great body of zoologists, in thinking that plants and animals very rarely hybridize in a wild state, I am not prepared to accept M. Nitzchke's view concerning the *Arctia*. It is not a mere statement of opinion which will determine such a question. He allows that his supposed hybrids produce seed which is apparently perfect. Let these seeds be sown and the results remarked for a few years. If they are fertile hybrids, I believe that the progeny will gradually revert towards one of the parent species until they become undistinguishable from it.

M. Nitzchke remarks that "these questionable species appear but seldom, and isolated, as is generally the case with hybrid plants." Such is probably their condition in Germany, and may be the fact with *A. intermedium* in Britain; but certainly this does not describe the mode of occurrence of *A. pubens* in Ireland. Until the summer of 1858, I should have been unable to state

anything more definite relative to the latter than to the former plant; but now I am able to say that *A. pubens* is abundant throughout a great part of the south of Ireland, where I could not find *A. majus*, and only saw one specimen of *A. minus*. This is conclusive against the hybrid origin of *A. pubens*. Whatever may be ultimately determined concerning *A. intermedium*, a plant with which I am very imperfectly acquainted, no doubt remains upon my mind of the existence of the other four plants as well-marked species, notwithstanding Mr. Bentham's remark "that no certain limits can be ascribed even to the three more generally recognized varieties." His success in finding intermediate forms surprises me; for, after an examination of hundreds of living individuals, I have failed in discovering them. The more I examine the plants, the more convinced I become of their distinctness. Each of them varies considerably, but within definite limits. During the last autumn, the radical leaves have attracted my special attention; and the plants seem to be quite distinguishable by them, as indeed I had long before been told by my acute friend the Rev. W. W. Newbould. Two of the species have their radical petioles hollow; and in the other two they are constantly solid. This hollowness is not the result of the stretching of the tissue from over-vigorous growth; for it is always well defined in outline, forms a tube with smooth sides, and may be found in all stages of the growth, from the younger leaf to one that is verging upon decay. If the slightest hollow is found in the petioles of the other species, it is manifestly the result of rupture, has no defined outline, nor smooth interior, nor constancy, and is very rare.

A. tomentosum has solid roundish petioles with seven very prominent angles and a deep furrow between the upper pair. The limb of the leaf broadly cordate-ovate, rather acute, but little longer than broad, broadest close to its base, which is truncate with two notches rather than truly cordate.

A. majus has solid rather quadrangular petioles, with the angles less prominent than those of *A. tomentosum*; and the furrow, although similar, is rather less deep. The limb of the leaf broadly cordate-ovate, with its broadest part at about one-third from the base, blunt, very little longer than broad. The leaf of *A. tomentosum* narrows pretty uniformly from its broadest part to its tip; that of *A. majus* is very slightly narrowed until about two-thirds of its length is attained.

I do not know the radical leaves of *A. intermedium*.

A. minus has roundish petioles with a hole in their centre, which is usually, perhaps constantly, small and nearly round, —slightly prominent angles, and a very shallow broad furrow. The leaf is deeply cordate-ovate, with its broadest part at about

one-third from the base, whence it narrows pretty uniformly to an acute tip. Its base is very deeply notched with lobes nearly parallel to the petiole, and parallel-sided.

A. pubens has roundish, or more usually oval petioles with a large hole, which is usually also oval, in their centre; five of the angles reduced to rather prominent ribs; the two upper ones, which are only slightly more conspicuous, have a very broad shallow furrow between them. The leaf is deeply cordate-ovate, with its broadest part near the base, whence it narrows, with much uniformity of curve, to the bluntish tip. Its base is less deeply notched than that of *A. minus*; and its lobes are rounded.

XXXVIII.—SPICILEGIA ENTOMOLOGICA. I.—*Description of Telocera Wollastoni, an apparently unrecorded species of Longicorn Beetle from Australia.* By ADAM WHITE, Assistant, Zool. Dept. Brit. Mus.

THERE is no part of the external structure of an insect more variable in different genera than the antennæ. Look at the Neuroptera for example. Take the short, few-jointed antennæ of those great-eyed Dragon-flies, with their bristle-ending last joint, and compare them with the long, many-jointed antennæ of an *Ascalaphus*, with the terminal joints expanded into a knob, so that Scopoli, whose writings White of Selborne often studied and quoted, looking to that character alone, described one of these strange Neuroptera as a butterfly.

Look, again, at Beetles; compare the filiform antennæ of a Tiger-beetle with the many-plated antennæ of a male Cockchafer, or with the strangely distorted antenna of a male *Meloë* or *Cerocoma*, or the wondrously expanded joint of a *Paussus*,—and how truly marvellous must be the diversity of uses and purposes for which these antennæ were made! The uses of the antennæ would form a magnificent subject of research; and the results, if recorded by an able pen, would make one of the finest, the most attractive, and the most interesting of books, particularly if illustrated with enlarged and accurate drawings.

But, to restrict oneself to Longicorn Beetles, the antennæ in this great group must always afford to the systematist the most easily detected zoological characters. Nowhere, except in a few *Anthribidæ*, which resemble Longicorns at first sight, are there longer antennæ than those of the males of some of the genera of this group; take, for example, the *Acanthocinus ædilis*, or *Macronemus*. And yet you will find Longicorns with very abbreviated antennæ; and in numerous sets, such as *Clyti* and

Callidia, the antennæ are by no means conspicuous for length. Again, if we restrict ourselves to Australian Longicorns, how strange are the curiously lamellated antennæ of the beautiful genus *Petalodes* of Newman, of which a second species exists in the Museum Collection, which I have named *P. plagiatus**, from the long pale-yellow smooth spot so conspicuous on each elytron from the middle to near the tip,—the basal half of the elytra being strongly punctured, a yellow punctured patch before the smooth patch, and only separated from it by a narrow stripe, of the general pale brown of the elytra! How different must be the economy of this insect, so far as the male uses these finely lamellated antennæ, from the economy of the *Scolecobrotus Westwoodii* of Hope, whose antennæ have their fore-edges strangely serrated! and yet the insects are not very distantly related. Then, again, the dilated antennæ giving *Telocera* somewhat of a *Languria* appearance, or of a *Triplax*, must have a purpose and use different from the simple linear antennæ of the *Callidia* and *Pytheus*, to which it is allied.

The genus which I describe under the name of *Telocera* is allied to *Pytheus* of Newman, one species of which only is known, the *Pytheus jugosus* from Sydney. As the genus *Brachytria*, close to *Pytheus*, varies in its coloration, and apparently in the different sexes, I thought that *Pytheus* and *Telocera* might possibly be sexes of one genus, and even of the same species, in that country of anomalies in structure, where the female of *Distichocera*, for instance, is totally unlike her partner. It would be very rash, in our present state of knowledge, to regard *Telocera* as such. There were three specimens of this pretty beetle in the collection bought by Mr. Stevens. One of these only I have seen. It is in the British Museum; the other belongs to Mr. Pascoe; while Mr. Thompson of Paris procured the third for his noble collection, during his late passage through London, on his route from America to the French capital. The figure, carefully drawn on the block by Mr. Ford, but much magnified, shows its curious form.

TELOCERA.

Antennæ long; first joint thickened, at base curved; second as usual small, somewhat globular at apex; third and fourth

* *Petalodes plagiatus*, White.

P. brunneus; antennis longe lamellatis pedibusque subpallidioribus; thorace scabroso-punctato, lateribus pilis brevibus densis flavidis ornatis; elytris apice subtruncatis, basi punctatis, post medium lævibus, plaga elongata prope suturam pallido-flava, altera plaga minore propius basin, sutura apice subspinosa; metathorace lateribus albo-pilosulis; abdominis lateribus albo-pilosis uninotatis. Long. lin. 8 ♂.

longer, and about equal in length; fifth, sixth, seventh and eighth joints about equal in length, each longer than the fourth; ninth, tenth and eleventh dilated, and forming a distinct club; the ninth triangular, truncated at tip; the tenth somewhat cup-shaped; the eleventh somewhat globose, rounded at the tip; these last three joints slightly flattened.



Thorax longer than wide, broadest about the middle, where it bulges but is not tubercled, narrower than elytra at the base.

Scutellum large, somewhat sunk, pointed.

Elytra narrow, elongated; shoulders prominent.

Eyes largish, very much emarginate in front, near the insertion of antennæ.

Femora strongly clavate.

Telocera Wollastoni, n. s.

T. capite, antennis, abdomine pedibusque nigris, thorace fasciisque elytrorum transversa postmediana miniaceo-rubris, elytris cæruleo-viridibus. Long. lin. 4.

Hab. Australia (Moreton Bay? Sydney?).

Thomæ Vernon Wollaston, Entomologo præstantissimo, auctori operis eximii, 'Insecta Maderensia,' viatori indefesso, in scientia literisque humanioribus erudito, coleopteron hoc pulchrum dedicatur.

Antennæ, head, abdomen and legs black. Thorax vermilion-red, punctured, and thickly clothed with erect hairs. Elytra at apex rounded, bluish green, with a broad red band across them behind the middle, and colouring the suture and sides of the elytron; apex of elytra blackish blue; the green before the red band is tinged with blackish blue; the shoulders are somewhat protuberant; elytra deeply punctate-striate, with erect hairs. Scutellum black, with deeply grooved lines. Legs black, with longish hairs; tibiæ, especially on the inside, clothed with dense, silky, short hairs with a brownish tinge.

Note.—The *Tæniotes Pazii* of Rojas, from Venezuela, described and figured in the Rev. et Mag. de Zool. 1856. t. . f. 2, is synonymous with *Lamia* (*Plectrodera*) *quadritæniator*, White, described in the Ann. & Mag. Nat. Hist. 1846, p. 48. The Museum specimen was from Guayaquil.

SPICILEGIA ENTOMOLOGICA.—II. *Descriptions of new Curculionidous Beetles collected on the Voyage of H.M.S. Herald.*

By M. HENRI JEKEL, of Paris. With Notes by ADAM WHITE.

M. JEKEL of Paris has kindly furnished me with descriptions of four new species of Rhynchophorous Beetles, collected on the voyage of H.M.S. Herald, when commanded by Capt. Henry Kellett, C.B., who entrusted them to me for description. The grant for the publication of the zoological results of that voyage was exhausted before the Annulosa were reached. The collections were formed chiefly on the Pacific shore of Central America; a few specimens were brought from more northern parts. I intend to give a list, with brief descriptions, of some of these. Dr. Berthold Seemann, whose fine work on the Botany of the Voyage has given him a great name among modern naturalists, was the chief collector.

I cannot pretend to give the detailed descriptions of M. Jekel, nor his micrometrical admeasurements, which must often be rather *individual* than *specific*. The care, however, and the detail displayed in the descriptions drawn up by Jekel and Dr. Horsfield are very evident to those who know and have thoroughly studied the subject. But never was the saying truer than in these days of railroad travelling and electric telegraph, "*vita brevis, ars longa*." The descriptions of Erichson, Germar, and Guérin-Méneville, of all modern entomologists, seem to me to be models, especially for species.—A. W.

Arrhenodes xanthozonatus, Jekel.

A. elongatus, *niger*, *subnitidus*, *antennis* (artic. 4 prim. exc.) *thoraceque opacis*; *rostro basi cum capite canaliculatis*, *dein bifariam crenatis*, *apice rude punctatis*; *thorace pone medium ampliato*, *angulis anticis spinosis*, *medio canaliculato*, *impunctato*; *elytris antice scrobiculatis*, *postice profunde punctatis*, *interstitiis alternis costatis*, *fascia lata ochracea pone medium ornatis*; *femoribus omnibus tibiisque anticis dentatis*. (♂)

Long. tot. 16, rostr. $3\frac{4}{10}$, cap. $1\frac{2}{10}$, thor. $3\frac{8}{10}$, elytr. $7\frac{4}{10}$ millim.

Latit. bas. rostr. $\frac{7}{10}$, bas. cap. $1\frac{3}{10}$, thor. ap. $1\frac{8}{10}$, pone med. $2\frac{8}{10}$, bas. 2, elytr. 3, truncat. apic. $1\frac{2}{10}$ mill. (♂)

Allied to, and of the same group as *Arrh. lineatus*, Sch.* *Rostrium* somewhat longer and narrower from the insertion of the antennæ to the apex than from that part to the base. Head sub-

* *Arrhenodes lineatus*, Sch. (Gen. et Spec. Curc. v. 476). The specimen described in that work by Gyllenhal is a ♀: the ♂ being unknown to him, he could not indicate the character belonging to that sex, of having the anterior angles of the thorax spinose. One such ♂ specimen may be seen in Mr. Bowring's Collection. No doubt the ♀ of the above-described species has the angles of the thorax unarmed, like that of the *Arrh. lineatus*.

quadrate, transversely incised posteriorly, where it forms a very short neck. Thorax subpulvinate, impunctate. Elytra parallel to beyond the middle, then narrowed to the apex, which is truncate. Ochreous fascia broadened towards the margin, its average breadth being $1\frac{1}{2}$ millim. Body beneath impunctate; the two anterior rings of the abdomen deeply canaliculate in their middle. Tooth of the anterior thighs strong; there is, besides, a very small one, half-distant from the apex. Tibiæ curved at their base; tooth of the anterior very strong.

Præpodes Jekelianus, White.

P. oblongo-ovatus, piceus, squamulis viridibus metallico-micantibus, in lineis duabus thoracis maculisque elytrorum lætius condensatis tectus; rostro tricarinato, carinis lateralibus versus basin subconvergentibus; thorace subconico, inæqualiter punctato-foveolato, medio subcanaliculato; elytris punctato-substriatis, apice acuminatis; pedibus purpureo-cæruleis.

♂ Angustior; thorace magis conico; elytris ultra medium parallelo-angustatis, apice singulatim acuminatis.

♀ Latior; elytris versus medium subparallelo-ampliat, apice conjunctim-acuminatis.

Long. tot. 15, rostr. $1\frac{6}{10}$, cap. $1\frac{2}{10}$, thor. $2\frac{3}{10}$, elytr. 9 millim.

Lat. bas. rostr. $1\frac{2}{10}$, bas. cap. $1\frac{6}{10}$, ap. thor. 2, bas. thor. 3, humer. $4\frac{7}{10}$, med. elytr. 5 millim. (♀). (H. Jekel.)

Hab. Choco, Columbia, as I have ascertained from a poor specimen bought at the Entomological Society's sale of insects. It was given to the Rev. W. Kirby by Mr. Bennett, who sent the *Phrenapates Bennettii*, which the venerable Rector of Barham named after him.—A. W.

Rostrum somewhat ampliate and incrassate at the apex; median carina reaching the front, the lateral ones obliquely convergent towards the base, which they do not reach. Head somewhat narrower in front, slightly depressed between the eyes. Thorax slightly flattened on the disk, apex truncate, base subsinuate. Scutellum small, somewhat rounded, subtransverse, covered with a bright, light metallic green squamulation. Elytra obtusely rounded at the base; shoulders obliquely subangular; rows of punctures regular, at the base hardly, posteriorly slightly striate. In the ♀, the interstices between the striæ 1-2, 3-4, 5-6, 7-8, 9-10, 11 and margin, are adorned with spots of a bright, light metallic green hue, lighter than the ground squamosity. In the ♂ only one of these rows of maculæ is evident—that between striæ 5-6, the others more or less rubbed away, and forming here and there a confused lighter condensation*.

* On the probable causes of that rubbing-away of the squamulation in the ♂, I have already given my opinion in 'Fabricia Entomologica,' i. vi. 6.—H. Jekel.

One ♀ from the Collection of the 'Herald;' but I have seen two ♂ in the Collection of the British Museum, labelled "S. America." There is another ♂ in Mr. Saunders's, without indication of locality, probably from the same source.

I have named this insect after my friend M. Henri Jekel, the very scientific and accomplished entomologist, who has studied and collected the species of the great division Rhynchophora so long and so indefatigably, and the author of that unique work, 'Fabricia Entomologica,' the descriptions, printing, &c., of which are all by M. Jekel. His part of the 'Insecta Saundersiana,' and his other memoirs on Curculionidæ, are all highly appreciated. This species may be known from all its congeners by its bluish-purple legs, the femora, especially of the fore-legs, being ornamented in front and at the base with metallic green scales. The squamulation of the head, thorax, and elytra is most delicate and varied, green being the predominating hue, blue on the sides of body and elytra, while the orange or golden-coloured scales mingled with them set-off these green scales in a very striking manner. A jeweller lately took a design for a pair of ear-drops for a lady, from a specimen of the species called *Præpodes vittatus*, a beautiful dark-coloured species with bright longitudinal bands of white and rich red on its elytra: the insect was represented hanging from an orange-blossom, while rubies and other jewels formed its body.—A. W.

Genus SYNOSOMUS*, Jekel.

Antennæ fractæ, subtenuæ, thoracis medium parum superantes; scapo recto versus apicem subclavatum sensim incrassato, oculum attingente; funiculo scapo longiore, articulis subconicis, apice truncatis, 1° latitudine apicali subtriplo, externis subduplo longiore, 2° primo paulo brevior, 3° secundo brevior, sequentibus subdimidio longior, 4°–7° subæqualibus, magis conicis, latioribus, latitudine apicali parum longioribus; clava breviter ovato-acuta, 4-articulata.

Rostrum capite dimidio angustius et longius, apice modice ampliatus et incrassatus, basi utrinque subcompressum supraque transversim leviter impressum; scrobe laterali, obliqua, primum lineari, profunda, dein mox ante partem inferam oculi evanescentim ampliata et terminata.

Caput breve, valde transversum, subconicum; oculis breviter ovatis, subperpendicularibus, deplanatis; fronte latitudine rostri.

Thorax amplus, antice subrectus, postice oblique truncatus, infra oculos obsolete lobatus, prope apicem parum constrictus.

Scutellum nullum.

Elytra subovata, basi conjunctim emarginato-truncata, thorace arcte applicata, exhumerata, h. e. extra thoracem non extensa, ibique

* Σὺν, pariter; σῶμα, corpus.

angulata, subconstricta, ab angulo ad medium sensim rotundato-ampliata, lateribus ad marginem inferam latam compressiuscula, præsertim postice; subperpendiculariter declivia.

Pedes mediocres; coxis sat magnis, subglobosis; femoribus modice clavatis, inermibus; tibiis apice ampliatis, intus unco mediocri armatis, anticis paulo incurvis, reliquis rectis; articulo tarsorum penultimo lato, profunde bilobo, ultimo biunguiculato, unguiculis basi liberis, divergentibus, simplicibus.

Corpus suboblongum, exscutellatum, exhumeralatum, squamosum, mediæ magnitudinis.

This genus bears a striking resemblance to the Mediterranean species of *Geonemus* (*G. murinus*, Sch., from Algiers); the formation of its rostrum and scrobs, of its exhumerate elytra, and the absence of scutellum, place it in the second subdivision of the Cleonidæ of Schönherr, near *Megalometis*, &c.—H. Jekel.

Synosomus geonemoides, Jekel.

S. oblongo-ovatus, niger, squamulis læte virescentibus submetallicis tectus; rostro leviter tricarinato, basi subimpresso compressoque; thorace amplo, latitudine brevior, prope apicem transversim, medio et basi utrinque, obsolete impresso; elytris punctato-striatis, interstitiis alternis postice convexis, mox pone medium ad suturam elevato-carinatis, dein perpendiculariter declivibus.

Long. tota 14, rostr. $2\frac{2}{10}$, cap. $1\frac{2}{10}$, thor. $3\frac{4}{10}$, elytr. 8 mill.

Latit. rostr. $1\frac{5}{10}$, bas. cap. $2\frac{8}{10}$, ap. thor. 3, med. thor. 4, bas. thor. $3\frac{5}{10}$, bas. elytr. $3\frac{7}{10}$, med. elytr. 5 mill.

General appearance of *Geonemus murinus*, but larger, thorax more ample, &c.—(H. Jekel.)

If this comes, as I believe it does, from the Pacific shore of Central America, its alliance to a group from the other side of the Pacific is particularly interesting in a geographical point of view. Most of the species of *Geonemus* are from Australia or New Guinea.—A. W.

Sphenophorus dimidiatipennis, Jekel.

S. ellipticus, niger, nitidus; thorace supra elytrisq. antice rufis, opacis, subholosericeis, subdeplanatis, illo maculis tribus, his signatura infra-humerali nigro-holosericeis ornatis.

Long. tota cum pygid. (rostr. excl.) 15, rostr. $3\frac{5}{10}$, cap. $\frac{7}{10}$, thor. 5, elytr. $7\frac{5}{10}$, id. cum pygid. 9 mill.

Lat. bas. rostr. $\frac{7}{10}$, ap. rostr. $\frac{4}{10}$, cap. bas. et thor. ap. $1\frac{7}{10}$, ante med. thor. $3\frac{9}{10}$, bas. thor. et elytr. $4\frac{2}{10}$, hum. $5\frac{2}{10}$ mill.

Size, general outline, and deplanation that of *Sphen. dispar*, Sch., but bearing a striking resemblance to *Sphen. sericeus* in the coloration of the upper side; the latter is nevertheless smaller, narrower in proportion, and more convex, &c.

Rostrum, head, scutellum, pygidium, body beneath (except

a large rufescent spot on each side of the pectus), and legs, black, naked, shining; the two posterior thirds and a subhumeral macula of the elytra black, opaque, velvet-like; anterior part of these and thorax rufous, opaque, the latter having three opaque maculæ (one at each side of the base, one above the middle) and its constricted apex black. Elytra punctate-striate, interstices convex. Pygidium tricarinate; base slightly, the remainder rudely punctate. Thorax beneath, sides of the abdomen, and ultimate segment almost entirely rudely and deeply punctate. Pectus entirely and middle of the abdomen obsoletely punctate.

Sitophilus Oryzae, Linn., Fab., &c.

Note.—M. V. de Motschulsky, in a note in his 'Etudes Entomologiques,' 4^e Année (1855), p. 77, speaks of a *Sitophilus Zea-Mais*, Motsch., injurious to Maize, as follows:—"Always larger than *S. Oryzae*, for which it is generally mistaken; the rostrum is longer, more abruptly strangulate above the eyes, punctuation of the thorax thicker," &c. Then he adds,—“I have not met with this species in Europe, nor with the *S. Oryzae* in America.”

M. de M.'s species is perhaps a distinct one; but, from his few words, and from the numerous variations and extended habitat of *S. Oryzae*, we might be led to believe that he has caught one of the extreme varieties in size and rugosity of that universal species, such as are to be found on all continents, even in Europe, where, however, it is generally smaller. But, as the species may turn out a good one when fully described, I will only dwell on the last part of his note. *Sit. Oryzae*, as Schönherr states, inhabits the whole globe, and is found not only in every continent, but also in various latitudes. I have hundreds of specimens, having been myself at one time anxious to ascertain whether there might not be several species mixed; but they are all one.

I have specimens from all parts of Europe; from Algiers, Senegal, Guinea, the Cape, Natal, Madagascar, Bourbon, &c., in Africa; from different parts of India, in Asia; from the United States (North and South), Texas, Yucatan, Cuba, St. Domingo, Honduras, Venezuela, St^a Cruz de Orinoco, Cayenne, Brazils, &c., in America. I possess American specimens as small as the smallest specimens from Europe. This species is just like many other widely distributed species, very variable in size, coloration, depth of punctuation, &c.; and I may quote an example even in several specimens from Cuba, caught together, representing the three extremes. The elongation and strangulation of the rostrum vary according to the sex and size, and are often only apparent.—H. Jekel.

The time is approaching when naturalists will be forced to give much wider geographical *runs* for their species. Many

mere local varieties are now deemed what are called “good species.” Dr. Hooker and other botanists have shown how very widely distributed many of our common plants are. On another occasion I may enter on this subject.—A. W.

Besides these, there are the two following species of the extensive group of the Calandridæ, the former of which is very distinctly coloured with two transverse, yellowish-red, subinterrupted bands on the elytra:—

Sphenophorus Spinolæ, Sch. Gen. et Sp. Curcul. iv. p. 883 (1838).

Scyphophorus interstitialis, Sch. loc. cit. p. 856.

XXXIX.—On the *Atlas and Axis* of the *Plesiosaurus*.

By LUCAS BARRETT, F.G.S*.

[With a Plate.]

IN a young specimen of *Plesiosaurus* presented to the Geological Museum of the University of Cambridge by Thomas Hawkins, Esq., the atlas and axis have not coalesced, and are detached from the remainder of the cervical series. The axis is nearly entire; but the atlas has lost part of its posterior articular surface, and the whole of the second subvertebral wedge-bone. The interesting unanchylosed condition of the four bones composing the atlantal cup is a sufficient excuse for occupying a small portion of the time of the Section with a comparison of these bones with those described by Prof. Owen in the ‘Annals of Natural History’ for 1847, and the corresponding parts of the skeleton of the new species of *Plesiosaurus* described by Prof. Huxley in the last Number of the ‘Geological Journal.’

We will first consider the structure of this specimen (Pl. XIII. figs. 1 & 2). The four bones composing the atlantal cup have been slightly displaced; and its shape is a little altered. The base of the neural canal is formed anteriorly partly by its centrum and partly by the expanded bases of the neurapophyses; posteriorly the centrum is much larger, and forms the entire base of the canal. The upper thirds of the neurapophyses are much expanded and bent backwards, their inner angles have not coalesced, and there is no trace of a neural spine. The anterior surfaces of the lower part of the neurapophyses are concave, and form the antero-lateral segments of the articular cup for the occipital condyle; laterally their inferior edges slightly overlap the first wedge-bone; posteriorly they thin away, exposing the postero-lateral edges of the centrum (fig. 1, c.).

* Communicated by the Author, having been read at the Meeting of the British Association at Leeds.

That part of the centrum which forms the middle of the upper half of the atlantal cup (fig. 1, c.) is hexagonal, and it has a small pit in its centre; posteriorly its articular face is three times as great (nearly as large as the articular surface of the body of the axis), and has a circular depression in the middle. The wedge-bone (fig. 1) forms the lower half of the articular cup, and has been produced behind into two long processes, the bases of which only remain.

The neural spine of the axis (fig. 2, n. s.) is long, and much thicker than that of any of the succeeding cervical vertebræ; the apex is broken off in this specimen. The neurapophyses are separated from the centrum by a distinct suture; and an oblique ridge connects on each side the anterior with the posterior zygapophysis. The antero-inferior edge of the axis is bevelled-off, forming an articular surface for the second wedge-bone; and the basal portions of two cervical ribs (figs. 2 & 2 a, p. l.) remain attached to the anterior lower part of the centrum: they must have partly articulated with the second wedge-bone.

The axis of *Plesiosaurus Etheridgii*, lately examined by Prof. Huxley, agrees entirely with that of this species; but there are some important modifications in the structure of the atlas.

Prof. Huxley describes the atlantal cup in this species as being divided by a triradiate mark into three portions—one inferior and two lateral and superior. The inferior piece corresponds with the lower half of the atlantal cup, or the anterior subvertebral wedge-bone, and the two supero-lateral pieces to the neurapophyses in the specimen first described, but their bases are much more developed.

There is a small circular bone in the centre, which Prof. Huxley considers to belong to the os odontoideum; it is the anterior articular face of that bone, and corresponds to the hexagonal bone in the middle of the upper half of the atlantal cup in the former species,—the difference in position being caused in this species by the great development of the supero-lateral pieces or bases of the neurapophyses.

The postero-lateral edges of this bone are greatly developed, forming a rounded ridge on both sides of the posterior part of the atlas: the extraordinary development of this part of the bone is the most remarkable feature in the atlas and axis of this species.

We now come to the species first described by Prof. Owen. We have two specimens, in the Woodwardian Museum, of this species, both from the Kimmeridge Clay of Haddenham, near Ely; the larger of the two was figured by Prof. Owen in the 'Annals of Natural History,' vol. xx.

The neural arches in both specimens are broken away; and

the bodies of the two vertebræ have so coalesced, that the original line of separation is scarcely visible. The neurapophyses and cervical ribs of the axis have become ankylosed to the bodies of that vertebra. The posterior half of the bottom of the neural canal in the atlas is formed by the true centrum of that vertebra; but in the anterior half the bases of the neurapophyses have spread over the centrum, and have united at the medial line. On the upper part of the atlantal cup a groove indicates the position of the original suture between the bases of the neurapophyses and the lower part of the atlantal cup. In the larger specimen there is a trace of the suture which separated the anterior subvertebral wedge-bone from the upper part of the atlas, but which is absent in the smaller specimen.

In the atlas of the three species of *Plesiosaurus* we have now considered, the anterior articular face of the atlas is made up of four bones: of these, the os odontoideum is the most variable in size. Prof. Owen correctly assigned to it a large share in the formation of the atlantal cup in the Kimmeridge Clay species. It forms about a third of the upper half of the cup in the young unankylosed specimen, and in *P. Etheridgii* is extremely small. Its position varies: in the young specimen (figs. 1 & 1 a) it forms the base of the neural canal of the atlas; in the Kimmeridge Clay species (figs. 3 a & 3 b) it is overlapped by the expanded bases of the neurapophyses; and in *P. Etheridgii* it occupies the centre of the cup. The bases of the neurapophyses of the atlas are most developed in this species, and least in the Kimmeridge Clay species; in all cases the anterior subvertebral wedge-bone forms a large portion of the atlantal cup. That the suture between this bone and the os odontoideum, in the atlas of the species figured by Prof. Owen in the 'Annals' for 1847, is correct, we have abundant proof in the structure of the atlas of *Pliosaurus*, where the os odontoideum is of exactly the same shape, and the wedge-bone separated from it by a similar suture.

It is remarkable that the Kimmeridge Clay species approaches more nearly the Ichthyosaurian type than the Lias species, not only in the greater development of the os odontoideum and in its lateral edges forming the lateral margins of the atlas, but in its supporting the neurapophyses; there is really no essential difference between the atlas of this species and the atlas of *Ichthyosaurus*.

The atlas of *P. Etheridgii* and that figured (figs. 1 & 1 a) show many Crocodilian affinities (the neurapophyses being supported both by the wedge-bone and the centrum); but the posterior edge of the centrum does not support a pair of ribs (pleurapophyses), and no trace of ribs articulating with the wedge-bone have been discovered.

The second vertebræ of the same species support cervical ribs articulated to their bodies ; but in all other respects they resemble that of the Crocodile.

EXPLANATION OF PLATE XIII.

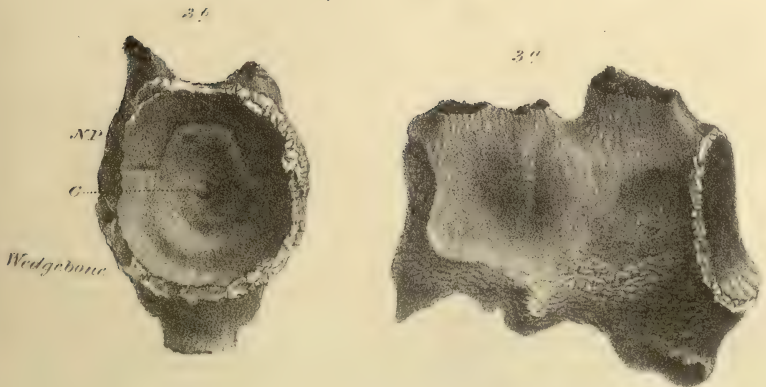
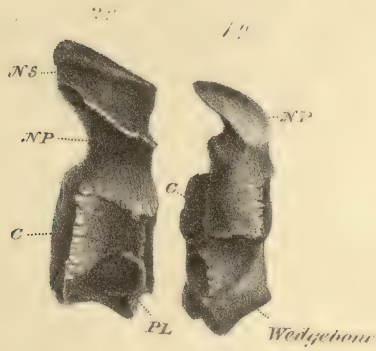
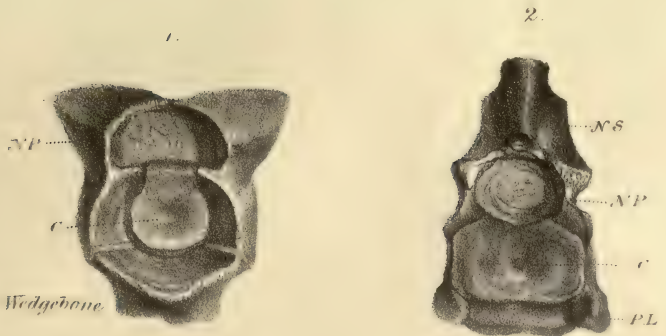
- Fig. 1.* Anterior view of the atlas of *Plesiosaurus* from the Lias : n. p. neurapophysis ; c. centrum.
Fig. 2. Axis of the same species : n. s. neural spine ; n. p. neurapophysis ; c. centrum ; p. l. pleurapophysis.
Figs. 1 a & 2 a. Lateral views of the same vertebræ : the same letters indicate the same parts as in figs. 1 & 2.
Fig. 3 a. Lateral view of the anchylosed atlas and axis of *Plesiosaurus* from the Kimmeridge Clay.
Fig. 3 b. The articular cup of the same specimen : n. p. neurapophysis ; c. centrum.

BIBLIOGRAPHICAL NOTICES.

Handbook of Zoology. By J. VAN DER HOEVEN, Professor of Zoology in the University of Leyden. Translated from the second Dutch Edition, by the Rev. WILLIAM CLARK, M.D., F.R.S. &c. 2 vols. 8vo. London, Longman's, 1856-1858.

CONSIDERING the high reputation enjoyed by the 'Handbook of Zoology' of Professor Van der Hoeven, not only on the Continent, but also amongst many English naturalists, it would be a work of supererogation were we to enter here upon any detailed criticism of its merits. A short notice of the classification adopted by the learned Professor of Leyden will, however, probably be acceptable to many of our readers ; and we shall therefore venture to give a general outline of it before proceeding to the more legitimate object of the present notice—the consideration of the mode in which Dr. Clark has executed his translation of this important work.

Professor Van der Hoeven commences his 'Handbook' with a general introduction to the study of zoology, containing a brief account of the distinctions between inorganic and organic bodies, and of the two great kingdoms into which the latter are divided,—an abstract of the tissues of animals, which he compares with the proximate elements of the chemist,—a very brief description of the structure and functions of the principal organs and of the development of animals,—and concluding with a short treatise on the art of classifying. In this he gives the characters of Cuvier's four great divisions of the Animal Kingdom, to which he adds a fifth, the Protozoa, in a foot-note ; but in his own classification he discards this distribution "except as a guiding idea," and divides the whole series of animals into seventeen great independent classes. We cannot help considering it a thing to be regretted that this "guiding idea" should not have been rendered more prominent and palpable to the reader ; by taking the opposite course, Professor Van der Hoeven has lost the





opportunity of indicating the morphological relations of his classes, which may be traced with gradually increasing clearness in the three higher divisions, whilst the only advantage gained by it is that he gets over the difficulty of determining whether the Echinodermata should be placed in one or other of two sections.

Professor Van der Hoeven excludes the Sponges altogether from the Animal Kingdom,—a course which has been adopted by some other continental zoologists, with but little justice, as it appears to us: his classification accordingly commences with the Infusoria, which may be regarded (with the above exception) as equivalent to the Protozoa, including both the true Infusoria and the Rhizopoda; and, singularly enough, considering that the Sponges are excluded, the *Volvocina* are still placed among the former, as are also some other forms (*Vibrionidæ*) whose vegetable nature is generally regarded as fully established.

The Radiata of modern authors form the three following classes, the *Polypi*, *Acalephæ*, and *Echinodermata*. Amongst the Polyps, Professor Van der Hoeven still includes, not only the Hydroida, but also the Bryozoa, although he admits that the latter would almost be better placed with the Mollusca. Of course, as the Hydroid Polyps are grouped in the same class with the true Polyps, the class of Hydrozoa of modern authors (the *Hydras-medusæ* of Leuckart) is not recognized by our author; his class of Acalephæ includes exactly the same elements as that of Cuvier,—a circumstance which is to be regretted, as the curious relations of the Hydrozoa, and the remarkable phænomena of their so-called alternation of generations can only be satisfactorily understood by regarding the Hydroid Polyps and Acalephæ as forming a single great group. The *Sipunculacea* are included amongst the Echinodermata.

With the fifth class, that of the *Entozoa*, divided into the two orders *Sterelmintha* and *Cœlelmintha*, we commence the great series of the Annulosa, including the classes *Rotatoria*, *Annulata*, or Ringed worms, of which the *Turbellaria* constitute the first order, *Insecta* (with the *Myriapoda*), *Arachnoidea*, and *Crustacea*.

The Mollusca, with our author, form three great classes, the *Tunicata*, the *Conchifera*, and the *Mollusca*. Considering the vast differences of organization existing between the Brachiopoda and Lamellibranchiata and the Gasteropoda and Cephalopoda, we cannot regard this arrangement as at all satisfactory on any grounds, and should have greatly preferred seeing the Mollusca divided, in accordance with ordinary usage, into at least five classes (besides the Bryozoa).

The Vertebrate Animals, which of themselves occupy the whole of the second volume, are divided into four classes, the author not regarding the distinctions manifested between the Batrachia and the true Reptiles as sufficient to warrant their separation into two classes. The classification adopted for the Fishes is to a certain extent modified in accordance with the views of Professor Müller,—that is to say, the *Leptocardii* and *Cyclostomi* are regarded as forming a distinct section from the *Chondropterygii* (*Selachii* of Müller), and the

Ganoid Fishes also form a separate section ; but the true Bony Fishes are divided into the four orders *Lophobranchii*, *Pectognathi*, *Mala-copterygii*, and *Acanthopterygii*, in accordance with the Cuvierian principles. The *Lepidosirens* are also referred to the class of Fishes, of which they form an order.

It will be readily seen from this sketch that the views of Van der Hoeven are to a certain extent intermediate between those generally held by naturalists at the epoch of the publication of Cuvier's 'Règne Animal' and those now adopted by the more advanced of our living zoologists, of whom Leuckart on the Continent and Huxley in this country may be regarded as the types. There are certain points in which his 'Zoology' is undoubtedly behind the age,—that is to say, points which appear to us to be fully established, and the truth of which is indeed admitted by our author, but the influence of which upon the classification of animals he seems to be unwilling to allow.

But we must quit this criticism of the original work, which has already occupied far more space than we intended, in order to say a few words upon that which is the true object of this notice,—Dr. Clark's translation. As far as we can judge from a tolerably minute examination of the book, the translation has been well and carefully effected, although in some cases we find Teutonic stiffnesses that might easily have been got rid of. It is indeed nearly a literal translation, and, with but few exceptions, appears to be exceedingly close to the original. In a few cases, however, we have noticed mistranslations, generally of little importance, and rarely such as seriously to vitiate the sense of the author. This applies to the translation of the Dutch text ; that of the Latin characters of the classes, orders, families and genera, which we think would have been much better left untranslated, has been very indifferently performed,—a curious circumstance, considering that it is the work of a Cambridge Professor. In translating these short pieces of Latin, Dr. Clark seems to have forgotten that the descriptive characters, even of zoological groups, are subject to the ordinary rules of grammar, and that, as a general rule, in the English language the adjective precedes the substantive which it qualifies. Thus, of the genus *Arcella* we are told, that the animal emits "processes variable, plane, obtuse,"—*Diffugia* is said to emit "processes of the animal variable, multifidous,"—*Alcyonium* has the "body covered with polyps scattered,"—and *Clepsine*, we are told, has the "mouth unarmed, furnished with a proboscis exsertile, tubular." In the case last mentioned, as in many others, it would be by no means difficult for a young student to connect the last adjectives in the paragraph with the first substantive ; and the accidental insertion of a comma would justify him in so doing. We cannot understand why Dr. Clark should have adopted this curious form in translating very intelligible Latin.

Dr. Clark has not, however, confined himself to the labour of translating, but has added numerous notes, many of them of considerable value, showing the progress of zoology during the period intervening between the publication of the original work and of

the translation. The portion of Van der Hoeven's book relating to the Protozoa was very defective, and here Dr. Clark has added some notes; but still this section is by no means satisfactory. At page 102 and the two following pages we find a good abstract of the recent investigations of Huxley, Leuckart, &c., upon the structure of the *Siphonophora*; and in pp. 109–119 numerous changes induced by these facts have been made. On pp. 135–138 the translator has introduced an account of the development of the Echinodermata, which is far more detailed than the same portion of the original work; and in describing the Entozoa (at pp. 173–176) he has given an abstract of the recent discoveries of development of those creatures, which have also caused him to omit Van der Hoeven's family of *Cystica*, now proved to consist of the developmental forms of Cestoid worms. He has, however, given descriptions of the different forms of Cystic worms at pp. 181–183. In the preface to the second volume the translator has added some further notes on the Invertebrated animals, including references to the valuable "corrections and additions" to the German translation, published in 1856 by Leuckart. From this we also learn that the author himself has made great alterations and additions to the second volume, so that, in Dr. Clark's own words, "this volume may be regarded rather as a third edition of the original than simply a translation of the second." The two volumes are illustrated with four-and-twenty plates, which are printed from the original copper-plates of the Dutch edition, and which, although some of them might doubtless be improved in appearance, will certainly prove exceedingly useful to the student.

Actinologia Britannica; a History of the British Sea-Anemones and Madrepores. With coloured figures of all the species. By PHILIP HENRY GOSSE, F.R.S. Parts I.–IV. 8vo. London, Van Voorst, 1858.

If the present rage for Aquaria have no other result, it has certainly been instrumental in increasing the number of recorded British species of Sea-Anemones. On all our coasts *dilettanti* and naturalists are busily engaged in rummaging the rocks in search of these beautiful flowers of the sea; Actiniæ form the most prominent ornaments of the artificial rock-pools which it is the fashion now-a-days to establish in almost every house; and if the observation of the habits of these beautiful captives be carried on with anything like the same zeal, we shall soon possess a tolerably complete body of information upon their natural history.

In the meanwhile, however, it must be confessed that the importance which the Actiniæ have acquired in the eyes of aquarists is leading to its natural consequence:—under constant examination, minute characters seem to grow into greater prominence; and hence the number of genera formed threatens to increase in an astounding ratio as compared with the number of species. Thus Johnston describes twenty-seven species of Actiniadæ, which are included in half-

a-dozen genera, whilst Mr. Gosse, in his paper published in this Journal in Junelast, raises this number to forty-one, or, if we include *Capnea* and *Corynactis*, which he then placed in a different section of Polypes, to forty-four; but these will form fourteen genera in the former case, and sixteen in the latter. In the present work, again, although it has advanced but a short distance on its course, we already find indications of the tendency to further division,—as Mr. Gosse *provisionally* proposes to break up his genus *Sagartia* (including about twenty known species) into no less than five groups, for which, in the event of their being hereafter raised to a more prominent place in the system, he has wisely and providently invented generic names. If this plan be carried out much further, as indeed it is likely to be,—not perhaps by Mr. Gosse himself, but by those who are to come after him, and who, with a more inordinate desire to shine in the world, may possess far less judgment,—we shall soon arrive at that point when there will be a genus for every species; and how far this is desirable, we may leave our readers to decide. We must content ourselves with calling attention to the fact that this tendency to the multiplication of genera in the Actiniadæ is getting to a great height; for we can by no means coincide in the suicidal wish expressed by a recent writer in the ‘Proceedings of the Zoological Society’ (see ‘Annals,’ Sept. 1858, p. 231), that there should be “a council formed of five, ten, fifty, or any number of the most celebrated naturalists, and that no new species or arrangement should be published without their consent being first obtained.” If the council did their duty conscientiously, we much fear that some of this gentleman’s productions would have little chance of appearing in print. There is, however, one passage in his paper with which, as far as we can understand it, we cordially agree. He says, “The rage for marine vivaria has thrown many useless workers into the field; and I much fear that what may possibly tend to a love of nature does not always as a matter of course advance science.” Of the truth of the first of these propositions no one can entertain a doubt; the second is less intelligible.

Begging Mr. Gosse’s pardon for stopping to pay this passing compliment to one of his fellow-labourers, we must proceed to the consideration of the four Numbers of his ‘Actinologia Britannica,’ now lying before us, premising that the numbers, which appear every two months, contain thirty-two pages of letter-press and a coloured plate.

The scope of the work is sufficiently indicated by its title; and the portion already published shows that Mr. Gosse is determined to spare no pains to render it as perfect as possible. He commences with a general description of the structure of the Actiniæ, including an explanation of the somewhat elaborate terminology which he has lately proposed. The classification adopted is the same as that of the author’s ‘Marine Zoology;’ but he has introduced into the present work a new and exceedingly valuable feature, namely the characters of the foreign families and genera, which must prove very useful to the investigator of the British Actiniadæ, by furnishing him

with a clue to the position of any species of genera previously unknown on our coasts which may reward his researches. The characters of the families and genera are given in analytical tables, and afterwards in a more detailed form. The generic descriptions in those cases where the genus contains several species are followed by analytical tables of the species, and we then come to the carefully drawn-up specific descriptions, which are preceded by short characters and by a very full synonymy. The varieties of the different species are also described in considerable detail, and this descriptive portion is followed in each case by an account of the habits and natural history of the species, and a list of the localities in which it has been met with. As there are few, if any, of our British naturalists who have had the same opportunities as Mr. Gosse of studying the Sea-Anemones in their native haunts, or who possess the power of describing their observations in the same lucid and interesting style, this portion of the work is most attractive and valuable.

The species described in the four Parts before us all belong to Mr. Gosse's family *Sagartiadæ*, to which we observe he now refers the genus *Capnea*, placed by him amongst the *Caryophyllacea*, in his Synopsis lately published in this Journal. They include the genera *Actinoloba* (*A. dianthus*), *Sagartia*, with fifteen species (five or six imperfectly known species being deferred to an Appendix), and *Adamsia*.

The plates illustrating the work are, like most of Mr. Gosse's, beautifully executed; they represent the various species and many of their varieties, adhering, in different states of expansion and contraction, to the walls of their rocky home, from which the bright colours of their delicate crowns of tentacles stand out in fine contrast. Each plate contains on an average about nine figures; and their beauty, coupled with the intrinsic value and interesting nature of the work, must render it equally acceptable as an ornament to the drawing-room table and as a handbook for the scientific naturalist.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

April 13, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

DESCRIPTION OF A NEW GENUS OF SPONGE (XENOSPONGIA) FROM TORRES STRAIT. BY DR. JOHN EDWARD GRAY, F.R.S., V.P.Z.S., PRES. ENT. SOC. ETC.

The Sponge here described was received from Torres Strait with some very interesting Madrepores and Polyzoa.

It is peculiar from its being free like the *Fungiæ* among the Madrepores, but more concave beneath, from its having the upper oscules placed in the diverging forked groove of the upper surface, and from its having the whole of the under surface covered with a thick coat

formed of agglutinated particles of silicious sea-sand, this coat being much thicker than the sponge itself; it is probably used to keep it in its place and position at the bottom of the sea.

Genus XENOSPONGIA.

Sponge free, discoidal, subcircular, concave below, convex above (rarely lobed on the side); the lower surface with a thick coat of agglutinated silicious sand of nearly equal-sized particles; the upper surface covered with a white leathery coat formed of felted spicula, studded with round tufts of glassy spicula, the tufts of nearly equal size, formed of numerous very fine transparent filiform spicula, forming a roundish brush, each tuft surrounded at the base by a slightly raised edge of the leathery upper coat; the circumference of the disk is surrounded by a uniform series of similar tufts. The centre of the upper surface is marked with a subcentral impressed groove with raised edges enclosing a series of circular oscules; this groove sends out branches diverging towards the edge, which are forked and reforked (or rarely trifid) as the disk enlarges, until they approach the edge of the circumference, which is surrounded by two continuous circular grooves, concentric with the margin, containing between them a single circular submarginal series of tufts of spicula.

When the sponge is young, the forked diverging grooves are few, definite, and evenly spread over the surface of the disk, with several series of tufts between them; but as the sponge increases in age, the grooves become much more numerous, closer together, nearly parallel with each other, and enclosing only a single series of tufts of spicula between the parallel grooves.

The substance of the sponge between the grooves is minutely netted, the interspaces of the network being formed of bundles of very minute spicula, with a single series of small uniform-sized, equal, roundish oscules.

The upper surface of the adult sponge is sometimes taken possession of by a species of *Balanus*, which forms a prominence on its surface, and is covered externally with a coat of the sponge.

XENOSPONGIA PATELLIFORMIS.

Hab. Torres Strait.

The particles of sand forming the lower coat of the sponge are as if they were imbedded in a kind of plaster, having a smooth uniform surface, exactly as if the sand had been well mixed with a small quantity of fluid mortar and then cast upon a smooth body.

The whole under surface is not perfectly smooth, but with more or less distinct impressed lines or concavities placed parallel with the circumference, showing the periodical increase in the size of the sponge.

There is scattered over the under surface of the larger specimen a few larger dark-coloured stones and a few fragments of shells, which give a variegated appearance to the coat. The larger specimen, after

it had reached a certain size, made an irregular growth on one of the sides, forming two rounded lobes which overlap each other, while the whole front retains the concave conical shape.

The lobe, which is expanded on the under surface of the other, is fringed with a continuous series of very close tufts of silky spicula. I have no doubt, as the bases of these tufts are to be seen on the rest of the margin, that similar tufts occupy the whole edge of the sponge in its perfect state, and have been rubbed off; they have been retained in this place, because it is better protected from external injury than the other part of the sponge.

In the larger specimens the grooves are much more irregular, as well as more abundant and more crowded than in the smaller one; and in some few instances they appear to arise in the surface independent of any connexion with the other grooves, which is not the case in the smaller example.

In the same specimen there are a few groups or rather lines of oscules, situated on the surface of the sponge itself, and not placed in the grooves, where all the other oscules are placed.

In the diverging grooves the texture of the sponge seems to be across the grooves, that is, parallel to the outer circumference of the sponge, leaving minute square pits in the network.

In the marginal grooves, on the contrary, chief fibres of the texture appear to be also across the groove, that is, radiating from the centre towards the margin; but this appearance may probably arise partly, if not entirely, from the manner in which the sponge has contracted when it dried, and may not be apparent in the fresh state; but having only a single specimen of the adult and young form of the sponge, I am disinclined to soak it in water and examine it in a moist state, fearing that it may spoil the specimen, which is now very brittle and inclined to crack from the edge to the centre of the frond.

NOTE ON A TALKING CANARY, ADDRESSED TO DR. GRAY, V.P.Z.S.
BY S. LEIGH SOTHEY.

The Woodlands, Norwood, Surrey,
March 26, 1858.

DEAR SIR,

Touching that marvellous little specimen of the feathered tribe, a Talking Canary, of which I had the pleasure a few days since of telling you, I now send you all the information I can obtain respecting it from the lady by whom it was brought up and educated at this our homestead.

Its parents had previously and successfully reared many young ones; but three years ago they hatched only *one* out of four eggs, which they immediately neglected, commencing the rebuilding of a nest upon the top of it. Upon this discovery, the unfledged and forsaken bird, all but dead, was taken away and placed in flannel by the fire, when after much attention it was restored and then brought up by hand. Thus treated, and away from all other birds, it became familiarized only with those who fed it; conse-

quently, its first singing notes were of a character totally different to those usual with the Canary.

Constantly being talked to, the bird, when about three months old, astonished its mistress by repeating the endearing terms used in talking to it, such as "*Kissie, Kissie*," with its significant sounds. This went on, and from time to time the little bird repeated other words; and now, for hours together, except during the moulting season, astonishes us by *ringing the changes*, according to its own fancy, and as plain as any human voice can articulate them, on the several words—"Dear sweet *Titchie*" (its name), "*Kiss Minnie*," "*Kiss me then dear Minnie*," "*Sweet pretty little Titchie*," "*Kissie, kissie, kissie*," "*Dear Titchie*," "*Titchie wee, gee, gee, gee, Titchie, Titchie*."

Now as I have shown that the great Melanchthon signed his name in no less than *sixty* different ways in uniting the words *Philippus Melanchthon* (see the plate of facsimiles in my work, a copy of which is in the British Museum), you will not be surprised at the extraordinary manner in which the dear little bird varies the several words he has learned.

The usual singing notes of the bird are more of the character of the Nightingale, mingled occasionally with the sound of the dog-whistle used about the house. It whistles also, very clearly, the first bar of "*God save the Queen*." It is hardly necessary to add that the bird is, of course, by nature remarkably tame; so much so, that, during its season, it will perch down from its cage on my finger, shouting and talking in the most excited state.

Our friend Mr. Waterhouse Hawkins, who has heard the bird, tells me that about twenty years ago a Canary that spoke a few words was exhibited in Regent Street, the only other instance, I believe, publicly known.

I have now only to apologize for having trespassed upon your patience to read all this long story about the accomplishments of a little bird; though at the same time I feel, that in acquainting you, as Vice-President of the Zoological Society, with the facts stated, I am not only giving you the means of placing upon record the same, but affording you the opportunity of witnessing the *truth* thereof, as being, in the event of any accident happening to the bird, a more satisfactory evidence than the mere assertion of,

Dear Sir,

Yours most faithfully,

Dr. John Gray.

S. LEIGH SOTHEY.

April 27, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

DESCRIPTIONS OF NEW SPECIES OF ANT-WRENS (FORMICIVORINAE). BY PHILIP LUTLEY SCLATER, M.A., F.L.S. ETC.

MYRMOTHERULA MULTOSTRIATA.

♂. *Nigra, albo striata: alis caudaque nigris albo limbatis et terminatis: subtus alba, lineis angustis nigris omnino striata.*

♀. *Capite ferrugineo, nigro striato: subtus pallide rufescenti-albida, striis minus crebris nigris.*

Long. tota 3·5, alæ 1·9, caudæ 0·9.

Hab. Upper Amazon, r. Ucayali (Hauxwell).

Mus. Brit., P. L. S.

FORMICIVORA ERYTHROCERCA.

♂. *Pileo nigro, loris et superciliis elongatis albis: dorso superiore griseo nigro variegato: interscapulii plumis ad basin albis: dorso postico ferrugineo: alis extus et cauda tota saturate rufis: alarum tectricibus superioribus nigris albo terminatis: subtus grisescenti-alba, nigro variegata, ventre cum lateribus et crisso ferrugineis; rostro brunnescente, pedibus pallidis.*

Long. tota 5·5, alæ 2·3, caudæ 2·7.

Hab. Brazil?

Mus. Dom. Eyton.

A single specimen of this apparently distinct species has been kindly lent to me by Mr. Eyton. The colouring of the upper surface resembles *F. ferruginea* and *F. Genæi*, but it is easily distinguishable by its pure rufous tail.

CERCOMACRA NIGRICANS.

Formicivora melanaria, Ménétr. Mon. Myioth. p. 500. pl. 9. fig. 2 ??

♂. *Cinerascenti-nigra, subtus nigra; macula interscapulii celata, tectricum alarium marginibus, remigum basi interiore et caudæ rectricum omnium apicibus albis: rostri nigri mandibula inferiore albicante: pedibus nigris.*

Long. tota 5·5, alæ 2·4, caudæ 2·5.

Hab. New Granada, S. Martha (*Verreaux*); Bogota.

Mus. Brit., P. L. S.

I received specimens of this bird from MM. Verreaux, labeled "*F. melanaria*." But that species seems to be "*coal-black*" above, and is from a very different zoological region. I therefore doubt their identity.

PYRIGLENA MACULICAUDIS.

♂. *Atra: campterio, tectricum alarium apicibus, macula dorsi celata et caudæ rectricum apicibus albis: rostro et pedibus nigris.*

Long. tota 5·5, alæ 2·7, caudæ 2·5.

Hab. Trinidad.

Mus. P. L. S.

I have two specimens of this apparently unnamed *Pyriglena* in my own collection. It is distinguishable from *P. atra*, *ellisiana*, and *serva*, by the white terminations of the tail-feathers. The bill is rather broader and stouter than in the typical species.

HYPOCNEMIS SCHISTACEA.

♂. *Cærulescenti-schistacea unicolor*: *tectricum alarium omnium apicibus minute albo punctatis*: *rostro et pedibus nigris*.

Long. tota 5·0, alæ 2·5, caudæ 2·0.

Hab. Upper Amazon; Rio Javarri (*Bates*).

Mus. Brit.

In the general form and somewhat slender bill this species resembles *H. erythrophrys*; but its uniform colouring renders it easily distinguishable from that and other described members of the genus.

ADDITIONAL OBSERVATIONS ON THE GENUS FURCELLA.

BY DR. J. E. GRAY, F.R.S., ETC.

Sir Everard Home, as I stated in my former paper*, figured the fragment of the vaulted continuation of the tube that closes its lower ends, for the shelly valves of the animal. Considering this as an accidental mistake, I took no further notice of it. An eminent comparative anatomist having observed,—“In the great *Teredo arenaria*, which lives in soft mud, the valves are wanting, according to Dr. Gray, or their homologues form the convex cap closing the periodical growths of the calcareous tubes” (“Mollusca,” in *Ency. Britan.* 353), I feel it incumbent on me to show the reasons why I cannot consider the “convex caps” closing the calcareous tube to be the homologues of the true valves, which, in my paper, I have said are entirely absent.

First. The caps have the structure, and are continuations of the tube, and have no relation to the usual valves of the *Teredo* in their form or structure.

Secondly. The convex caps here referred to are evidently identical in structure and formation with the convex cap that is found on the end of the tubes of the allied genera *Clavagella* and *Aspergillum*; and as these genera have the shelly valves of the animal in their proper situations, on the sides of the body, quite distinct from the convex caps, I think it is conclusive that they are not the homologues of the valves, in those genera, as both the valves and the caps which are considered as their homologues are present together, so that I must consider the convex cap in those genera as I do in *Furcella*, only as a continuation of the shelly tube in which the animal lives, and having no more affinity with the shelly valves than the tube of *Gastrochæna* and some *Lithodomi* and other perforating Mollusca.

Thirdly. It is to be remembered that some species of the true genus *Teredo*, which have distinct shelly valves, also form a shelly convex cap at the base of their tube in front of the animal, exactly similar in structure and situation to the cap of the genus *Furcella*, as I mentioned in my former paper; so that I cannot consider it only as a septum formed by the animal for its protection during the period of rest in those species of *Teredinidæ* which have true, well-deve-

* See Annals, vol. i. ser. 4. p. 295.

loped, shelly valves, and also as the homologue of the shelly valves in the genus of the family which is without true valves.

Hence I must continue to regard *Furcella* as a Conchifer without shelly valves, or any part homologous to them; and if we were to find a Conchifer without valves, I should consider their absence would be most likely to occur in a family in which the valves of the normal members are so reduced in comparison with the size of the animal as in *Teredinidæ*, where they have been regarded as "mere appendages of the foot;" this also being a family of Bivalve Mollusca, in which the animals always live in a shelly tube, it is one in which the valves are least required for their protection.

Since I sent in the former paper, I have had the opportunity of examining Mr. Cuming's series of *Furcella* from the Island of Camiguen, one of the Philippines, where they live in hard mud left exposed at very low water.

Mr. Cuming has several specimens of the tube of the young animal, which commence with a much smaller diameter than the specimen previously described, and enlarge more rapidly in thickness, so that the tube is more conical. He has two examples of the base of the tube of larger specimens, which end in the cap formed of two overlapping arched plates, showing that to be the normal formation of the termination. All the specimens have two separate apical siphonal tubes.

He has also two specimens of the upper part of the tube, which are of a slender, elongated, nearly cylindrical form; both are pierced through the whole length by two central semicylindrical tubes, separated by a narrow opaque septum. One of these specimens is water-worn, the other as fresh as if it had been broken from a living specimen; the latter shows at the fracture that the apex of the tube is formed of a number of concentric laminæ deposited one within the other. The two semicylindrical siphon-tubes are surrounded with a special opaque shelly lamina, the septum between them being of the same thickness and structure; and between the outer surface of this tube of the siphon and the inner surface of the cylindrical outer sheath or tube, there is a transverse space at each end of the central septum, between the two siphonal tubes, filled with a deposit of a loose, spongy, cellular, shelly texture.

Mr. Cuming has two small tubes from California which appear to belong to the genus *Teredo*, and which have the lower or larger end of the tube closed with a single hemispherical cap like those described in my former paper. In one the cap is simple and terminal, and the apex of the tube is oblong and quite simple; in the other the cap at the lower end of the tube is larger, rather distorted, and bent on one side of the axis of the tube, and the aperture at the apex of the tube is partially divided by a series of plates, which have a prominence in the middle on each side, forming an imperfect division of the cavity.

I may add, that the siphonal end of the tube being divided into

two distinct tubes is not a distinctive character of *Furcella*, as we have in the British Museum a *Teredo* or rather a *Xylotrya* from Sierra Leone which has some of its tubes furnished with two distinct siphonal apertures, others in which the tubes are only partially separated, and others with a simple aperture.

The “Cloisonnaire de la Méditerranée” of M. Matheron (Annales des Sciences et de l'Industrie du Midi de la France, vols. 1 & 2), quoted by Deshayes (Ann. Sci. Nat. xi. 245), is evidently a *Teredo*, furnished with shelly valves and palettes, and not a *Furcella*.

ON A NEW GENUS AND SEVERAL NEW SPECIES OF UROPELTIDÆ, IN THE COLLECTION OF THE BRITISH MUSEUM. BY DR. J. E. GRAY, F.R.S., V.P.Z.S., F.L.S., PRES. ENT. SOC.

These animals, when first discovered, were arranged with *Typhlops* by Schneider; and afterwards Cuvier, who had previously regarded them as belonging to that genus, formed for some of them a genus under the name of *Uropeltis*. In the ‘Catalogue of the Specimens of Lizards in the Collection of the British Museum’ (12mo, 1845), I formed for them a family under the name of *Uropeltidæ*, and divided the species into three genera, each containing a single species. I lately described a fourth genus named *Morina* in the ‘Proceedings’ of this Society (1858).

Professor Johann Müller, in an article on the “Osteology of Reptiles” in Tiedemann’s ‘Zeitschrift für Physiologie’ for 1831 (vol. iv.), gave an account of the osteology of the two genera *Rhinophis* and *Uropeltis*. Schlegel in 1837 regarded them as a genus under the name of *Pseudotyphlops*, and noticed three species.

Instead of this family being characterized by the tail being “cylindrical, obliquely truncated above,” it ought to be described as tail cylindrical or compressed, covered with keeled scales, which are separate or more or less united into a horny shield,—the scales on the tip of the tail being always united and many-keeled.

Having occasion to re-examine the various specimens which we have received since the printing of the Catalogue above referred to, I have found several additional species.

The family may be divided into three groups, according to the form of the tail.

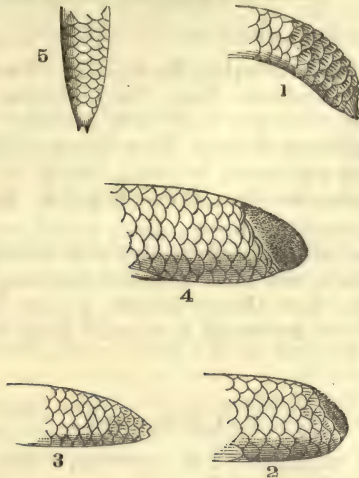
I. *The tail obliquely truncated with a flat superior disk.*

1. **SILBOURA.** Disk oblong, covered with separate, two or four keeled scales.

2. **UROPELTIS.** Disk circular, covered with a single tubercular plate.

II. *The tail subtruncate ; end convex, rounded, covered with a single horny tubercular shield.*

3. MYTILIA. Caudal shield many-keeled ; nose more or less acute.



1. *Siloboura Elliotti*.

2. *Mytilia Templetonii*.

3. *Plectrurus Perrotetii*.

4. *Mytilia unimaculata*.

5. *Mytilia melanogaster*.

III. *Tail oblong, compressed, covered with separate 3-keeled scales ; tip covered with a small compressed cap-like spinose shield.*

4. MAUDIA.

I. *Tail cylindrical, obliquely truncated, with a flat superior disk.*
Uropeltina.

1. SILOBOURA, Gray.

Tail obliquely truncated ; disk oblong, covered with rhombic, two- or four-keeled scales, the scales on the lower edge of the disk larger, tubercular above, and having two acute tubercles on its sharp lower edge.

* *Scales of caudal disk four-keeled.*

1. SILOBOURA ELLIOTI (fig. 1).

Siloboura ceylonica, Gray, Cat. Brit. Mus. 142 (not Cuvier).

Caudal disk oblong, elongate ; scales of the disk four-keeled ; brown, with a narrow yellow streak on each side of the neck, a broad yellow

band in front of the vent continued in a band on each side of the tail.

Var. Larger scales of caudal disk three- or four-keeled.

Hab. Madras (*Walter Elliot, Esq.*).

**** Scales of caudal disk two-keeled.**

2. SILOBOURA CEYLONICA.

Uropeltis Ceylonicus, Cuvier, R. A. ii. 76 ; Cocteau, Mag. Zool. 1833, t. 2 (not *S. Ceylonica*, Gray, Cat.); Müller in Tiedemann's Zeitschr. Phys. iv. 252, 273. t. 21. f. 4, 5, skull?

Siluboura Ceylonicus, Kelaart, Prod. Fauna, 156.

Pseudotyphlops ceylanicus, Schlegel, Abbild. 45.

Coloburus Ceylonicus, Dum. & Bib. Erp. Gén. vii. 164. t. 59. f. 3.

Caudal disk roundish, oblong ; scales of disk two-keeled ; black, a broad irregular yellow band on each side of the neck from the angle of the mouth, and some yellowish marbling on the sides of the body becoming more obscure behind ; a broad yellow cross-band in front of the vent, continued in a broad band to the sides of the tail.

Hab. Ceylon.

2. UROPELTIS.

Tail obliquely truncated ; disk roundish, covered with a single flat roundish granulated shield.

1. UROPELTIS GRANDIS.

Uropeltis (sp. ?), Kelaart, Prodromus, 155.

"*Uropeltis grandis*, Kelaart." In Brit. Mus.

Caudal disk subcircular, with large scattered tubercles ; nose subacute, rather produced ; dark brown ; chin and beneath yellowish brown, with some of the scales dark brown in the centre near the hinder edge.

Hab. Ceylon (*Kelaart*). Dr. Kelaart's type specimen.

2. UROPELTIS PARDALIS.

"*Uropeltis pardalis*, Kelaart."

Nose convex, rounded ; caudal disk subcircular, scarcely tubercular ; back black, with numerous small white specks on the back and sides ; caudal disk brown, smooth, with a narrow white edge above and a white spot on each side of the lower edge ; belly white, three or four irregular rows of oblong transverse black spots.

Hab. Ceylon (*Kelaart*). Dr. Kelaart's type specimen.

3. UROPELTIS? PHILIPPINUS.

Uropeltis Philippinus, Müller, Tiedem. Zeitschr. für Physiol. iv. 248, 274. t. 22. f. 1 *a, b, c*, skull ; f. 3, animal nat. size ; Dum. & Bib. Erp. Gén. vii. 161. t. 59. f. 2.

Rhinophis Philippinus, Boie, Isis, 1827, 513 ; Müller, l. c. 248.

Typhlops Philippinus, Cuvier, R. Anim. ii. 72.

Pseudotyphlops philippinus, Schlegel, Abbild. 44 (not figured).

Hab. Philippines.

This species is unknown to me. One specimen in the Paris Museum.

II. *The tail cylindrical, subtruncate; end covered with a single horny convex tuberculated shield; nose acute.*

3. MYTILIA.

Caudal disk convex, covered with a single convex shield, covered with small spine-like ridges; rostral scales produced, more or less acute.

Rhinophis, Dum. & Bib. Erp. Gén. vii. 150.

* *Caudal shield with a slight perpendicular keel; rostral scales square, rather acute.*

1. MYTILIA GERRARDI.

Mytilia Gerrardi, Gray, Proc. Zool. Soc. 1858, p. 57. Rept. pl. 13.

Caudal disk large, with a slight perpendicular terminal keel; black; white spot over the upper edge of disk.

Hab. Ceylon (*R. Templeton*, Esq., 1845).

2. MYTILIA TEMPLETONII (fig. 2).

Caudal disk small, covered with radiating lines of uniform spines, with a slight perpendicular apical keel; blackish-brown, with the middle of the scales rather paler, a large irregular yellow streak on each side of the neck, and a few yellow cross-bands on the sides, becoming small and more indistinct behind; a yellow spot on each side of the vent, extending in an irregular narrow line to the end of the tail.

* *Hab.* Ceylon (*R. Templeton*, Esq.).

** *Caudal shield convex, rounded, without any terminal keel; rostral shield compressed, produced, very acute.*—? *Rhinophis*, Hempr.

3. MYTILIA UNIMACULATA (fig. 4).

Uniform grey-brown (in spirits), with pale edges to the scales, those of the under side being the broadest, with a single oblong transverse yellow spot in front of the vent.

Hab. Ceylon (*Thwaites*).

We have two specimens of this species,—one not in a good state, rather discoloured, being uniform red-brown, from the Haslar collection, and another, in good state, received from Mr. Thwaites in 1856. They both have the same preanal spot and keelless caudal shield.

The species is most like the *Pseudotyphlops oxyrhynchus* figured by Schlegel, Abbild. 43. t. 12, which is said to be the *Typhlops oxyrhynchus* of Schneider, Amph. ii. 341; the *Rhinophis oxyrhynchus*, "Hemp. Berl. Mag.," Wagner, Syst. Amph. 195; the *Rhinophis punctata*, Müller in Tiedem. Zeitschr. Physiol. ii. 248, 273. t. 21. f. 1, 2, 3, skull; t. 22. f. 1, head shield; f. 1, *d, e, f*, caudal disk, which Schneider says came from Coromandel, and Professor Johann Müller from Guiana: but I think the latter must be a mistake, as no species of the family has yet been found on the Western continent. The specimen figured by Schlegel in the Leyden Museum differs from the one here described, chiefly in having no yellow spot in front of the vent, and in being provided with a dark spot in the centre of the scales, forming a central and some lateral lines on the back, and a single line of spots on the underside of the tail and the hinder part of the belly near the vent. I have no specimen which agrees with it in these characters.

It is doubtful if Schlegel's figures of this genus differ from *Morina*; but Professor J. Müller describes the tail as covered at the end with a "hard oval horny shield," and he says *Uropeltis* has a caudal shield exactly like *Rhinophis*, and rough with granulations; he further observes that there is no other difference between the external form and the skull of the genera, except in the form of the rostral shield, which in *Rhinophis* is sharp and keeled and produced. At any rate *Rhinophis* and *Morina* were not established on the same kind of characters, and the sharpness or bluntness of the rostral shield differs in the species of both genera; and though the name and character is applicable to this kind, the nose of the other species of the genera more resembles that of the genera *Siloboura*, *Uropeltis*, and *Maudia*.

*** Caudal shield small, with a terminal transverse dentated keel; rostral shield square, rather acute.—Crealia.

4. MYTILIA MELANOGASTER (fig. 5).

Above brown (in spirits), with indistinct pale lines between the series of scales, formed by very small pale dots on the outer sides of the scales; sides white from lips to vent; belly black, white-spotted; tail above and below like the back, dark, with indistinct pale lines; caudal shield tridentate at the tip.

Hab. Ceylon (*Thwaites*).

We procured through Mr. Cuming two specimens of this species, which were sent home by Mr. Thwaites in 1854.

See also—

1. *Rhinophis Philippinus*, Dum. & Bib. Erp. Gén. vii. 134. t. 57. f. 1.
2. *R. oxyrhynchus*, l. c. 156.
3. *R. punctatus*, l. c. 157, only known from figures.

III. *Tail oblong, compressed, covered with separate three-keeled scales; tip covered with a small compressed cap-shaped spinose shield.*—*Plectrurina*.

4. PLECTRURUS.

Tail oblong, compressed, covered with separate three-keeled scales; apex furnished with a small compressed cap-shaped shield, covered with small spines, and ending in a central perpendicular spinose keel. Nose rounded, rather produced. The central ventral series of scales rather broader than the other scales, six-sided.

1. PLECTRURUS PERROTETII (fig. 3).

Pale brown (in spirits), paler beneath, with a more or less large and distinct oblong transverse yellow spot in front of the vent.

Plectrurus Perrotetii, Dum. & Bib. Erp. Gén. vii. 167. t. 59. f. 4, skull; t. 76. f. 1.

Hab. Madras (*J. C. Jerdon, Esq.*, 1846); “Neelgherries.”

Var. 1. With a series of obscure small pale spots between each series of the dorsal scales.

Var. 2. Tail with a central line of white spots on the upper side, and with a row of white spots on each side near the vent, converging and united in the middle of the end of the tail; hinder part of upper lip white.

Var. 3. Scales of the tail nearly smooth; in other specimens these scales are very distinctly three-keeled.

We have a smaller specimen of this animal, which we received from the Fort Pitt Museum, as having been sent by Mr. Ford from the Cape of Good Hope; but as they had many specimens from India in that Museum, I suspect this habitat is a mistake, as the genus has not yet been received with certainty from Africa, and it is scarcely likely that an Indian species should be also found in that country.

ON CARPENTERIA AND DUJARDINIA, TWO GENERA OF A NEW FORM OF PROTOZOA WITH ATTACHED MULTILOCULAR SHELLS FILLED WITH SPONGE, APPARENTLY INTERMEDIATE BETWEEN RHIZOPODA AND PORIFERA. BY DR. J. E. GRAY, F.R.S. ETC.

Many years ago I observed on some specimens of *Cardita variegata*, which Mr. J. Ritchie, the late Consul of Tripoli, had collected at Marseilles and sent to the British Museum, some specimens of a parasitic shell which resembled a *Balanus* in shape, but when more carefully examined were evidently not formed in the same manner as the shells of that class of animals; as however they were not in a good condition, it was not easy to decide from what animal they derived their origin.

Mr. Cuming some years later, when he transmitted his collection of Cirripedes to Mr. Dawson for examination, sent with them some

shelly bodies attached to the surface of a *Porites* Coral, and to different kinds of shells, such as *Pecten* and *Cardita*, which that naturalist returned to Mr. Cuming as "not Cirripede;" Mr. Cuming then brought them to the British Museum, requesting me to examine and describe them. These specimens brought to my mind the shells I had formerly received from Mr. Ritchie; a casual examination of their form and structure at once showed me that they could not belong to a *Cirripede*, and as they presented some characters which were not to be observed in the Mediterranean specimens, a careful study of them led me to consider them as nearly allied to the Foraminifera, but differing from any form with which I was acquainted, in being permanently attached to marine bodies; and they were so unlike, both in size and form, to any shells of the kind previously known, that several persons to whom I had expressed this opinion doubted their affinity to them. I therefore laid the specimens aside, in hopes that some other specimens might occur that would more fully elucidate their structure, and show their affinity to other known animals.

Though most of the naturalists to whom I have shown Mr. Cuming's specimens were inclined to regard them as a peculiar form of *Cirripede* shell, each examination of them tended to strengthen my original opinion, that they were a new form of *Foraminifera*; and this was further confirmed when I accidentally discovered that the cells were filled with a fleshy substance, in which bundles of simple sponge-like spicula were imbedded. This induced me to show them to Professor George Busk, and to inquire of him if he had ever seen any coral, or other natural body, to which they could be allied. He stated that he had not, unless they were the shells of a *Cirripede*; and on my expressing to him the opinion I had formed of their probable formation and affinity, he stated that it was not impossible that I was right, and that they might be an intermediate form of *Rhizopod* between a *Foraminiferous* shell and a *Sponge*, which is exactly the idea I had formed of their position, considering them as a *Sponge* that was surrounded by and provided with a shelly case with a single terminal *oscule*.

Being desirous of obtaining other opinions on the subject before publishing any account of them, I transmitted the specimens to my friend Dr. William Carpenter, stating my belief that they were a new form of *Rhizopod* which had been mistaken by several naturalists for the shell of a *Cirripede*, giving him permission to take off and examine one of the specimens. He has most kindly sent me the following note:—

"University Hall, April 23, 1858.

"MY DEAR SIR,

"Your guess was a very sagacious one. The structure of the shell is most characteristically *Foraminiferous*, being riddled full of holes like a *Rotalia*. In the interior of the only specimen I have laid open was a brownish animal residuum full of *Sponge spicules*. Of course there is no great improbability in the idea that the *Sponge* was para-

sitical; but I am inclined to believe that this organism is the connecting link which I have long thought must exist between Sponges and Foraminifera, and that it is in fact a Sponge whose integuments have been consolidated into a Foraminiferous-like shell. You will find that the interior is not one single undivided cavity, but that it is loculated; and sections of the shell show a sort of areolation corresponding with the little bosses of the exterior.

"I do not think that you will satisfactorily elucidate the organization of this creature, unless you have several sections made in different directions through the shell. I have limited myself to the one which you gave me the liberty to break up, with which I have done the best I could. I should like to have these (two) slides back again, and to have one or two perfect specimens, if you could spare me a corner of your block.

"Yours very truly,
"WILLIAM CARPENTER."

This account exactly agrees with my previous examination, as it was the knowledge that the shell was multilocular and minutely foraminated like the multilocular Foraminifera, which induced me to regard it as the case of a *Rhizopod*; and the knowledge that the cells were filled with a fleshy substance strengthened with spicula like certain sponges, induced me to believe that they were also allied to the Porifera or Sponges; and in my note to Dr. Carpenter transmitted with the specimen on the 21st of April, 1858, I stated that "I regarded it as a *Rhizopod* of a new form; it is formed of a number of cells each ending in a terminal pore. The cells look like the valves of a Barnacle, and that is the reason that Mr. Cuming and my German friend think it is one; but the examination of the structure at once proves that it cannot be one."

Being strengthened by the opinion of Professor Busk and Dr. Carpenter, I have ventured to bring the subject before the Society; and I propose to form for the Philippine specimens a genus which I shall name *Carpenteria*, after Dr. William Carpenter, who has paid so much attention and has been so successful in elucidating the structure and organization of these animals.

I shall merely give a slight description of the genus, sufficient to distinguish it from other marine bodies, and send some of my specimens to Dr. Carpenter, in the hope that it will enable him to add a full account of its formation and structure to his paper on the Foraminiferous Shells which he is preparing for the Transactions of the Royal Society, assisted by the funds of that body.

1. CARPENTERIA.

Shell conical, attached by the broad base, formed of a series of elongated cells, each ending in a contracted mouth, piled one against another in a spiral manner, and with the aperture of the last cell at the apex in the centre of the acute cone. The substance of the cells is formed of a network of calcareous anastomosing ribs; the

interspaces between the ribs are thin, calcareous, prominent externally, and pierced with numerous perforations. The cavity of the cells is filled with a fleshy sponge-like body, strengthened by nume-

CARPENTERIA.

Fig. 1.

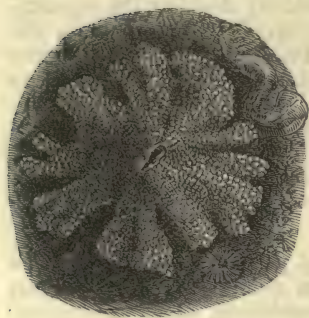


Fig. 2.



Fig. 1. Exterior surface complete.

Fig. 2. Partly eaten off by acid. a. Complete.

Fig. 4.



Fig. 3.



Fig. 3. Cross sunken cells, showing the spicula in the cells.

Fig. 4. Part of Fig. 3, more magnified. a. Outer parietes of cells.

rous minute, simple, pin-shaped and fusiform smooth spicula placed in bundles.

C. BALANIFORMIS.

Hab. Philippine Islands, on *Porites*, *Cardita*, *Pecten*, and other shells.

The conical shell is furnished with a single contracted aperture at the apex of the cone; as each cell is formed it closes the aperture of the preceding cell, so that only one is seen at the top of the cone. Some specimens show two or rarely three apertures at the tip of the cone; but this arises from the tip having been broken; these apertures are of a larger size and irregular form, very unlike the contracted uniform-shaped aperture of the last cell.

When the shell is worn, or partly destroyed by acid, the thin part between the network is destroyed, leaving only the calcareous ribs, which fill the greater part of the cavity, leaving a cavernous calcareous body somewhat like a sponge turned into stone.

A section of the parietes of the cells appeared to be formed of polyhedral plates separated from one another by a rather opaque line, as if formed by the union of the edges of the plates; and each plate is pierced with a number of uniform-sized, regularly disposed circular perforations, leaving a nearly uniform imperforated belt round the margin of each plate.

The specimens on the shells of *Cardita variegata* from the shores of the Mediterranean are so different in substance and structure from those found (on the same species of shell among others) on the shores of the Philippines, that I propose to form for them a second genus, named in honour of M. Felix Dujardin, the Professor of Biology and Dean of the Faculty of Sciences at Rennes, who first described the animal of the many-chambered microscopic shells, which had before been generally considered as the residence of Cephalopods! (the most complicated organized mollusca), instead of the most simply organized animal.

2. DUJARDINIA.

Having the same external appearance and form as the preceding genus; that is, formed of cells aggregated together in a spiral form, the last cell being furnished with an apical opening; but the cells appear to have a simple cavity, and are formed of a thicker, harder, uniform shelly coat, which is very closely and uniformly pierced all over with very numerous, minute, equal-sized parallel pores. The cavity of the cell —? in the imperfect specimen which I have been able to examine, is simple; but then it has evidently been well washed, probably with acid.

DUJARDINIA MEDITERRANEA.

Hab. Mediterranean; Marseilles, on *Cardita variegata* (J. Ritchie, Esq. 1817).

These genera appear to me to form a distinct group of *Rhizopoda*, which may be called *Fenestrifera*, characterized by the animal being

always attached to marine bodies, and the cellular body of the animal being strengthened with spicula and enclosed in a calcareous cell furnished with a single contracted aperture and pierced with numerous foramens or tubes.

These shelly bodies differ from all the shells of *Rhizopods* hitherto known, in being attached, and in the form, structure, and disposition of the cells, which (should the existence of spicula on the body prove a peculiarity of the genus *Carpenteria*, where alone it has been observed) is sufficient to form a group distinct from the other *Rhizopods*.

The existence of these spicula shows that the genus *Carpenteria*, and probably all the group, forms the passage between the *Porifera* and *Rhizopods*, which has been long suspected to exist, but has not before been described.

On the Mediterranean specimens of *Cardita variegata* there is intermixed with the *Dujardinia* a species of *Lepralia*, the anomalous *Polytrema minaceum*, consisting of numerous layers, one deposited on the other, each formed of a calcareous network, with small equal hexangular interspaces, and undefined patches of a crust formed of rough calcareous cells placed side by side like the cells of a *Lepralia*, but much more unequal in size and irregular in form than the cells usually found in that genus. The parietes of these cells are pierced with numerous equal-sized minute pores like the foramens of *Foraminifera*, the whole substance of the cell being apparently formed of numerous short shelly tubes placed parallel side by side. The cells are furnished with a small roundish hole at one of their extremities, which is often hid by the convexity of the other cell.

This may be a peculiar genus of *Lepraliadae* allied to my genus *Cribrillina* (Cat. Brit. Radiata, pp. 116, 147), which has "foraminiferous cells," as Professor Busk calls them; or it may prove to be another form of *Foraminifera*. If the former, the form of the cells and mouth, and the structure of the cell-walls, are sufficient to distinguish it from *Cribrillina*. As the only way to draw attention to it is to give it a name, I propose to form for it provisionally, until its nature is better understood, a genus named

PUSTULARIA.

Cells ovate, four- or five-angled, convex, crowded together side by side, forming a crust without any definite form; the cells closed, their entire parietes being pierced with numerous close uniform minute pores; the cavity simple; aperture small, roundish, simple at the front end of the cell (without any ovarian cells?).

1. PUSTULARIA ROSEA.

The crust rose-red, rather rugose.

Hab. Mediterranean.

MISCELLANEOUS.

On the Death of the common Hive-Bee, supposed to be occasioned by a parasitic Fungus. By the Rev. H. H. HIGGINS, M.A.

ON the 12th of March last, Timpron Martin, Esq., of Liverpool, communicated to me some circumstances respecting the death of a hive of bees in his possession, which induced me to request from him a full statement of particulars. Mr. Martin gave me the following account :—

“In October last I had three hives of bees, which I received into my house. Each doorway was closed, and the hive placed upon a piece of calico; the corners were brought over the top, leaving a loop by which the hive was suspended from the ceiling. The hives were taken down about the 14th of March, and two were healthy, but all the bees in the third were dead. There was a gallon of bees. The two hives containing live bees were much smaller, but in each there were dead ones. Under whatever circumstances you preserve bees through the winter, dead ones are found at the bottom in the spring. The room, an attic, was dry, and I had preserved the same hives in the same way during the winter of 1856. In what I may call the dead hive, there was abundance of honey when it was opened, and it is clear that its inmates did not die from want. It is not a frequent occurrence for bees so to die, but I have known another instance. In that case, the hive was left out in the ordinary way, and possibly cold was the cause of death. I think it probable that my bees died about a month before the 14th of March, merely from the circumstance that some one remarked about that time that there was no noise in the hive. They might have died earlier, but there were certainly live bees in the hive in January. I understand there was an appearance of mould on some of the comb. There was ample ventilation, I think; indeed, as the bees were suspended, they had more air than through the summer, when placed on a stand.”

When the occurrence was first made known to me, I suggested that the bees might probably have died from the growth of a fungus, and requested that some of the dead bees might be sent for examination. They were transmitted to me in a very dry state, and a careful inspection with a lens afforded no indication of vegetable growth. I then broke up a specimen, and examined the portions under a compound microscope, using a Nachet, No. 4. The head and thorax were clean; but on a portion of the sternum were innumerable very minute, linear, slightly curved bodies, showing the well-known oscillating or swarming motion. Notwithstanding the agreement of these minute bodies with the characters of the genus *Bacterium* of the *Vibrionia*, I regarded them as spermatia, having frequently seen others indistinguishable from them, under circumstances inconsistent with the presence of *Confervæ*, as in the interior of the immature peridia and sporangia of Fungals.

In the specimen first examined there were no other indications of the growth of any parasite; but from the interior of the abdomen of a second bee I obtained an abundance of well-defined globular bodies, resembling the spores of a fungus, .00012 to .00016 inch in dia-

meter. Three out of four specimens subsequently examined contained within the abdomen similar spores. No traces of mycelium were visible; the plants had come to maturity, fruited, and withered away, leaving only the spores.

The chief question then remaining to be solved was as to the time when the spores were developed, whether before or after the death of the bees. In order, if possible, to determine this, I placed four of the dead bees in circumstances favourable for the germination of the spores, and in about ten days I submitted them again to examination. They were covered with mould, consisting chiefly of a species of *Mucor*, and one also of *Botrytis* or *Botryosporium*. These fungi were clearly extraneous, covering indifferently all parts of the insects, and spreading on the wood on which they were lying. On the abdomen of all the specimens, and on the clypeus of one of them, grew a fungus wholly unlike the surrounding mould. It was white and very short, and apparently consisted entirely of spores, arranged in a moniliform manner, like the filaments of a stemless *Penicillium*. These spores resembled those found in the abdomen of the bees, and, I think, proceeded from them. The filaments were most numerous at the junction of the segments. The spores did not, I think, resemble the globules in *Sporendonema muscæ* of the English flora, neither were they apparently enclosed.

The Rev. M. J. Berkeley, to whom I sent some of the bees, found, by scraping the interior of the abdomen with a lancet, very minute, curved, linear bodies, which he compares to Vibrios. He also found, mixed with them, globular bodies, but no visible stratum of mould.

From the peculiar position of the spores within the abdomen of the bees, and from the growth of a fungus from them unlike any of our common forms of *Mucedines*, I think it probable that the death of the bees was occasioned by the presence of a parasitic fungus.—*Proc. Lit. and Phil. Soc. of Liverpool*, Session 1857–58.

On a new species of Toucan. By Mr. J. GOULD.

ANDIGENA SPILORHYNCHUS.

Crown of the head and back of the neck glossy black; back, wing-coverts, and margins of the primaries dull sienna-brown; secondaries bluish brown; upper tail-coverts blue strongly tinged with green; tail slaty blue tinged with green, the four central feathers largely tipped with chestnut; band across the rump sulphur-yellow; throat and cheeks white, blending into the light blue of the breast and abdomen; thighs rich chestnut; under tail-coverts blood-red; feet greenish blue, with a lilac tinge on their under surface; bill black, with a mark of obscure brownish red at the base of the upper mandible, which, when viewed in front, much resembles the letter W, this colour advancing for a short distance on each side of the culmen and extending down the sides of the base.

Total length, 18 inches; bill, $3\frac{3}{4}$; wing, 7; tail, $7\frac{1}{2}$; tarsi, $1\frac{3}{4}$.

Hab. Forest of Beza, on the eastern side of the Cordillera in Ecuador.—*Proc. Zool. Soc.* March 23, 1858.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[THIRD SERIES.]

No. 12. DECEMBER 1858.

XL.—*On the Cambium-layer of the Stem of the Phanerogamia, and on its Relation to the Increase of Thickness.* By H. VON MOHL*.

DURING the last twenty or thirty years, investigations on the development of the stem have led to the discovery that, in spite of the great difference of structure in the stems of the Monocotyledons and Dicotyledons, the course of their development presents a far greater agreement than was formerly imagined. Satisfactory as this progress is on the one hand, yet, on the other, labourers in this field have, at least so it appears to me, promulgated many erroneous theories; hence a discussion of this subject will not be inopportune.

It will be most convenient to recur, in the first place, to Schleiden's works. In his explanation of the peculiarities of vegetable tissues†, he assumed the existence of three stages of cell-development in the earliest period. In the first stage, the new products present themselves in the form of an *apparently* structureless, yellow, pultaceous mass; in the second stage, in which the process of cell-formation has just ceased, there is a distinct delicate cellular tissue with more homogeneous contents, which, however, is still completely saturated with sap; in the third stage, the cellular tissue assumes a blackish appearance, arising from the fact that all the intercellular passages are then emptied of sap and contain only air.

According to Schleiden's view, the arrangement of the cellular tissue influences the conformation of the stem exclusively in the first stage. This depends—1. on the *arrangement of the*

* Translated from the 'Bot. Zeitung,' xvi. p. 184 *et seq.*, June 25 and July 2, 1858, by Arthur Henfrey, F.R.S., &c.

† Grundz. d. wiss. Bot. 1843, ii. 127.

secondary cells in the parent-cells, so that a linear disposition of the secondary cells in the parent-cells in the long axis of the stem lays the foundation of an elongated internode—an arrangement agreeing with the angles of a tetrahedron (*sic?*), of an undeveloped internode—and an arrangement in a plane standing perpendicularly to the axis forms an internode greatly developed in breadth; 2ndly, on the *form of the process* itself, this ceasing at certain places sooner than in others.

In the second stage of the process of cell-development, the general uniform expansion of the cells formed in the previous stage can alone act; in this period, therefore, the volume may alter, but not the form and relations.

In the third stage, the expansion of the existing cells is the exclusive influence in determining form.

This distinction of three stages is retained in the later editions of the same work (3rd ed. ii. p. 132), and the cambium (*cambial layer, formative layer*, p. 153) is specially defined as a cellular tissue which has not yet ceased to form new cells, which, according to the passages above referred to, would be limited to the first stage.

It will not be superfluous, before going further, to examine this conception of the cambium a little in detail. I leave out of the question the circumstance that examination made with any care shows that the youngest cellular tissue never forms an even apparently homogeneous pultaceous mass, but that its composition of cells is always clearly perceptible—so that the observer can find no distinction between the first and second stages; and the further circumstances, that the cells of vegetative organs are multiplied by division, and not by free-cell-formation, and that the intercellular passages do not become visible in consequence of the fluid contained in them being replaced by air, but from the cells, which in the cambium-layer are connected together as far as their extreme angles, subsequently separating from each other at the angles, which become rounded-off. A more important circumstance is, that the multiplication of cells occurs not merely in the period which Schleiden calls the first stage, but also in the second, and very often in the third: consequently, that division into stages, attempted by Schleiden, cannot be carried out; and the assertion that all elementary organs originate in the first stage of cell-development of an organ, and that the subsequent development of the latter depends simply upon growth of the cells, is decidedly incorrect.

I believe that, in the examination of a young organ, we may distinguish three stages of cell-development; but these must be differently defined. The youngest and most rudimentary parts are composed of parenchymatous cells closely applied together

and forming a uniform tissue, in which we can find no trace of the subsequent separation into parenchyma, vascular bundles, &c. We may term this, with Schacht, the *primary parenchyma* (*Urparenchyma*): the restriction of the term *cambium* to this tissue would be very appropriate, were it not that this name has long been generally applied to the structures of the second period, and especially to the still more developed cambium-layer of Dicotyledonous trees. In the second period the tissue separates into the different classes of tissues, the formation of parenchymatous cells being continued by the division of a portion of the cells in different directions of space; while in other groups of cells the formation of elongated cells, vessels, &c., results from the predominance of longitudinal division, and the omission, or rare occurrence, of cross-division. In this period also the tissue has very delicate cell-walls, and, from the absence of intercellular passages, is still transparent. The cell-walls of this and the preceding period have the peculiarity, in contrast to the walls of more developed cells, that they attract the pigment from a solution of carmine, and become tinged bright red. The commencement of the third period, in which the tissue emerges from the condition of cambium, is marked in the parenchyma by the appearance of intercellular passages, which become filled with air, and in the elongated cells, vascular tubes, &c., by the deposition of secondary layers. The longitudinal division of the parenchymatous cells in the direction parallel with the surface of the axis has now pretty well ceased; but the transverse division and the multiplication of cells lengthwise of the axis lasts for a considerable time longer in many cases. This allows the possibility of particular parts of a tissue, thus tolerably advanced in development, and even arrived at complete conformation, recurring again to the condition of cambium, producing within them a young tissue by cell-division, thus giving rise to the formation of vascular bundles, peridermal layers, &c.

Passing from the consideration of the cambium to Schleiden's account of the development of the stem, the following five cases are described*.

A. The first distinction occurs between Monocotyledons and Dicotyledons, in the latter of which the individual vascular bundles continually increase in thickness, while in the Monocotyledons this process of cell-formation ceases from below upwards, and hence thickening of the individual internodes becomes impossible, and a thickening of the axis can only arise successively from the following internodes becoming constantly broader.

The *Dracænæ*, indeed, form an exception to this.

* Grundzüge, 1st ed. ii. p. 128.

B. If the formative process advances regularly from below upwards, a definite plane of the base ceasing to form cells, a cylindrical ascending axis is formed. This process occurs in stems with elongated internodes.

C. If the process of cell-formation ceases at particular parts of the periphery earlier than at others, the result is an axis with projecting ridges, trigonous, &c.

D. If the cell-formation lasts longer at the circumference than in the middle, and the terminal bud is of the usual conical form, the cell-formation occurs, not in the whole cone, but only in a superficial region, forming a kind of conical cap or mantle on the cone (*Kegelmantel*), so that the whole free surface of the cone contains the younger cells, the central part of the cone the older. Here the whole axis of the cone ordinarily rises cylindrically upwards; but not by similar superposed disks (as in B), but by superposed hollow cones (*Kegelmantel*). Each new internode is a hollow cone of this kind, and therefore cannot be cut off by a section perpendicular to the axis, but only by a cut following the surface of the cone. If the process of cell-formation lasts somewhat longer in the later internodes than in the earlier, a more elongated hollow cone is formed, which consequently projects over the base of its predecessor, which would otherwise be free, and the new internode becomes broader in proportion to the older (in *Melocactus*, *Zea*, &c.).

E. If the cell-formation ceases earlier at the margin than in the middle, and the new cells formed in the middle arrange themselves successively in planes, the margin must rise up, the middle becoming gradually developed into a hollow form, just as a disk of lead becomes concave when it is hammered in the middle and not at the edges. In this way is produced the funnel-shaped end of the stem of *Echinocactus*, the calyx of *Rosa*, &c.

In another place (ii. p. 147) Schleiden gives the following explanation of the variation of the internal organization of stems, in which he sets out from the idea that, as the cellular tissue is formed, a portion of it is always changed into vascular bundles; consequently the direction of the vascular bundles depends wholly upon the direction of the formative energy. On this account, in long-jointed stems, where the cell-development takes place from below upwards, as it were, in horizontal disks, the vascular bundles are straight and tolerably parallel to the axis of the stem; where, on the other hand, one hollow cone is superposed on another in the terminal shoot, the vascular bundles take, in their first formation, a course from the base of the cone to its summit, therefore from the circumference of the internode to its axis; and subsequently, when new internodes are super-

added, the vascular bundles of the first hollow cone are developed on through the following, as far as the circumference, where they enter leaves or buds. They therefore form an arc convex internally, the length and convexity of which depend upon the form of the terminal bud.

Since all the new portions, whether these be in the form of thickenings of the old vascular bundles in the Dicotyledons, or the rudiments of new vascular bundles in the Monocotyledons, are constantly formed on the outside of the primary vascular bundles, the older and deeper-seated bundles running from the axis to the periphery of the leaves and buds must necessarily cross the younger bundles ascending higher in the axis, or the cambial structures which have been formed from within outwards.

In reviewing Schleiden's explanation of the development of the stem, we recognize above all, as the great merit of it, the statement that, as has long been known of the Dicotyledons, so also in the Monocotyledons, the origin of the vascular bundles occurs in a cambium-layer situated under the surface of the stem, in which is developed, simultaneously with the bundles, the parenchymatous tissue destined for the further completion of the stem. This explanation forms a strong contrast to the views of Meneghini, who believed that the vascular bundles were formed in the well-developed parenchymatous tissues through the influence of currents of sap. The correctness of the account given by Schleiden has been confirmed by all subsequent researches.

We cannot speak so favourably of the other parts of this theory, since Schleiden gives far too little weight to the diversities of internal organization corresponding to the systematic position of plants, and attributes far too much value to the external form of stems, especially to the length of their internodes, and ascribes their outward variations to internal differences of development which do not exist in nature.

That the Monocotyledons and Dicotyledons cannot be sharply separated from each other in respect to the internal structure of their stems—a series of intermediate structures existing—has long been known; yet, for all that, the distinction is very clearly marked in the great majority of cases. Schleiden only pays attention to the growth in thickness of the Dicotyledonous bundle, and the absence of this in the Monocotyledons. But this very point is well known to present many exceptions; it is therefore important to keep in view the second great distinction—the internal, convex, curved course of the vascular bundles of the Monocotyledons.

That I directed especial attention, in my '*Anatomy of Palms*,' to this course of the vascular bundle, and to the difference of structure which one and the same bundle exhibits in different

parts of its course, depended partly on the nature of the material at my disposal, which afforded me the means of studying the developed stems of a great number of Palms, but not the deep investigation of the history of development of the stem,—partly on the necessity of laying particular stress on this point, because it afforded the most striking evidence against the doctrine of the endogenous growth of the Monocotyledons, at that time universally received, and adopted by DeCandolle for the systematic division of the Phanerogamia. But even now the matter is not to be put aside so simply as is done by Schleiden; for this different course of the vascular bundles is a very characteristic mark of the Monocotyledonous stem, and the result of a peculiar mode of development.

In the majority of the Dicotyledons the young vascular bundles lie side by side in the cambium-layer, and ascend, without suffering any curvature towards the centre of the stem, up to the point where they turn outwards to the leaf; and the cambium-layer traverses in an uninterrupted circle the individual vascular bundles and the parenchymatous cells lying between them, so that the liber-layers of all the vascular bundles are situated outside the cambium-layer, in the bark. If new vascular bundles are formed, these are developed in the same cambium-cylinder which had given birth to the older vascular bundles, and between the latter. But since, in the interval between the formation of the older and younger vascular bundles, the former have been somewhat advanced in their development, and their woody portion thickened in the direction of the radius of the stem, the medullary cellular tissue of the stem having also grown outwards in like proportion, and the cambium-ring being thus forced outwards, the inner part of the wood of the younger bundles lies at a somewhat greater distance from the centre of the stem than the corresponding part of the older bundles, yet without the intermediate and outer parts of the new bundles being pushed further out than the older bundles.

In the Monocotyledons matters are essentially different. The vascular bundle formed by a direct transformation of a part of the cambium-layer lies, as in the Dicotyledons, in its whole length within the cambium-cylinder,—or rather, since the bud is always drawn to a point at the *punctum vegetationis*, within a hollow cone (*Kegelmantel*), forming a continuation of the cambium-cylinder. Simultaneously, and not only beside it but also on the peripheral side, parenchymatous cellular tissue is formed from the cambium, and through this the constantly renewed cambium-cone is moved outwards from the vascular bundle towards the circumference of the stem. This production of cellular tissue outside the vascular bundle is almost or quite

at an end at that part of the stem where the lower end of the bundle lies, but increases more and more upwards; whence, in examining full-grown stems, the lower end of the individual vascular bundles are found at the outward boundary of the medullary parenchyma, and mostly covered only by a couple of layers of cells which belong to the latter tissue, while the upper part of the bundle, which at its origin is only separated from the centre of the stem by a small and no longer multiplying number of cells, and is subsequently covered on its outer side by thick layers of cells, is found deeply seated in the stem. The uppermost extremity, lastly, which already in the bud is connected with a leaf, in the further development of the bud must follow the leaf in proportion as this is pushed outwards from the centre towards the cylindrical periphery of the stem, and, in the same proportion as the cellular tissue is multiplied at the circumference of the stem, undergo an intercalary growth between the centre of the stem and the base of the leaf, and assume a more or less horizontal course from within outward. Since the same process is repeated in the cambium-cone pushed further out towards the periphery, the younger bundles, which originate in the expanded cambium-mantle, must run separate from the older, and further out in the stem. If, as is often the case in the Palms, both earlier- and later-formed bundles enter the same leaf, the place of the curvature into the leaf of the younger bundles will be found not so deeply seated in the full-grown stem as that of the older, because, at the time of their first development, the base of the leaf and the cambium-cone were already further removed from the centre of the stem, by the production of medullary cells, than at the formation of the older vascular bundles running into the same leaf. This condition was first made out and rightly explained by Meneghini.

Schleiden was well acquainted with this diverse mode of development of the Monocotyledonous and Dicotyledonous bundles; unfortunately, he adopted the notion that this was altogether independent of the circumstance whether the plant belonged to the Monocotyledons or Dicotyledons, but stood in connexion with the circumstance whether the internodes of a stem were elongated lengthwise into a cylinder, or remained abbreviated. In consequence of this, he fell from one error into another.

The mode of development of a cylindrical stem mentioned by him under B, in which the development progresses from below upwards in horizontal disks, whereby the vascular bundles acquire a straight direction and a position parallel with the axis, does not exist at all. Every stem, be its form what it may, terminates above in a *punctum vegetationis*, in which its leaves are formed, and towards which its youngest vascular bundles con-

verge. This condition remains exactly the same, whether the apex of the stem be drawn out conically, flattened, or depressed. Whether the vascular bundles are all subsequently arranged in a cylinder under the rind, or whether, as in the Palms, they run inwards towards the centre of the stem, has nothing at all to do with the longer or shorter state of the internodes of the stem, but depends solely upon the difference above described, whether the cambium-cone continues to form parenchyma outside the vascular bundle or not. This does not take place in Dicotyledons with short internodes, as in *Sempervivum*, because it is not in accordance with the growth of Dicotyledons, while, on the other hand, it occurs in Monocotyledons with elongated internodes. The curved course of the vascular bundles of the latter from the leaf inwards to the centre of the stem, and from this, again, outwards and downwards to the periphery, was indeed discovered by me, in a hollow-stemmed Palm with long internodes. Schleiden is altogether incorrect (ed. 3. p. 158) in the detailed exposition of the proofs of the peculiar mode of vegetation which he ascribes to stems with long internodes,—that in them, for instance in the Grasses, the vascular bundles lying in one internode do not originate *seriatim* from within outwards, but are developed and perfected simultaneously. Examination of the terminal bud of a large Grass, for instance *Arundo Donax*, shows most distinctly, as indeed was already well known to Moldenhauer, that the outer vascular bundles originate much later, and occur in the still completely cambial condition while the inner already possess spiral vessels.

Just as little can we approve Schleiden's representation of the growth of stems with short internodes and a short bud-axis; for he here derives the vascular bundles, not from a common cambium-cone embracing the whole axis of the bud, but from a series of numerous successively-formed, funnel-shaped, hollow cones, stuck into one another, and with free margins. It is self-evident that this idea is decidedly incorrect, if applied to short-jointed Dicotyledonous stems, for instance to a fleshy *Euphorbia*, a *Sempervivum*, &c.: for the stems are constructed in every respect in the same way as the long-jointed; and it has no influence upon the mode of development of the individual internode and its vascular bundles, whether this grows in the longitudinal direction for some time after its emergence from the condition of a bud, by cell-development and expansion, or whether this process occurs only in a slight degree. We might be more inclined to countenance this notion in reference to the development of Monocotyledonous stems, since in these one cambium-cone is certainly formed over another; but the matter takes place in a different way from that described by Schleiden, and exactly in

the same way as in a stem with cylindrical and elongated internodes, whose terminal bud is really just as conical as that of a short-jointed stem. The cambium-cylinder of a Dicotyledonous stem, which is constantly transformed on its inner side into woody layers and cells of medullary rays, and is constantly renewed on its outer side by development of cells, consists at different epochs of totally different cells, and occupies also a different place; but it remains always essentially the same, and no one would represent the matter by saying that in the course of time a more or less considerable number of distinct, concentric cambium-cylinders had been formed. Just as little ground, however, exists, if we do not admit this view, for regarding, with Schleiden, the development and renovation of the conical cambial mantle of the conical bud as the product of distinct and successive funnel-shaped cambial mantles, sticking into one another, with their edges free. The latter assumption rests upon a totally mistaken notion. Schleiden's view, that the bud possesses a distinct cambium-mantle in each internode, has no foundation in fact; one cambium-region is common to them all, and only its higher and lower zones correspond to the individual internodes. No trace exists of a free margin of a cambium-mantle belonging to a single internode; but the zone of cambium corresponding to each internode forms the immediate continuation of the cambium-zone of the next internode below, just as in cylindrical stems. When, with the advancing development of the bud in the upper portion of the cambium-mantle, the inner part is transformed into vascular bundles and parenchyma, and its outer part is renovated by development of cells, and in this way a new and more externally situated cambium-mantle is formed, this renovation occurs in a degree continually decreasing downwards to the place where the production of new cells entirely ceases, and the cambium-mantle passes into the now no longer productive cambial cylinder of the lower part of the stem. Hence the growing downwards of an upper cambium-mantle over the free margin of that belonging to a lower internode, in stems which are thicker above, is out of the question, since no such free margin exists. If a stem becomes thickened into an inverted cone, this arises from a greater number of elementary organs being developed in the upper internodes; but this does not generally take place suddenly, and it is not that an upper internode grows down over the periphery; for the lower internode takes part in the development of the upper, becoming inversely conical and passing gradually into the latter.

No less erroneous is the view that the cambium-cone corresponds to an internode, and that consequently the newly-formed vascular bundles run from the circumference of the internode to

its axis, and subsequently, when new internodes are superadded, are developed onward through the new cambium-cones, to reach the buds and leaves. It is certainly conceivable that the vascular bundles might arrive at the middle of the stem already at the end of the first internode, and in the second internode run into the leaf, although no such stem has yet presented itself to me; but that would not alter the matter at all, and in such a bud there would be just as little correspondence of a special cambium-cone to each internode, as in a plant in which each vascular bundle runs through a dozen internodes.

Completely erroneous also is the idea that in short-jointed stems the internodes have a conical form corresponding to the form of the cambium-mantle, and stick into one another like funnels, so that they cannot be separated from one another by a horizontal section. A longitudinal section through the apex of a distinctly-jointed stem, for instance of *Arundo Donax*, shows that the internodes are not attenuated upwards, but that they are either separated from one another by horizontal planes, or are depressed downwards, so as to be concave.

This last condition leads me to the consideration of the form of stem spoken of by Schleiden under ϵ , in which the bud is excavated in the middle. This not unfrequent depression of the point of the axis he believes to arise from the cell-formation ceasing sooner at the margins than in the middle, and that consequently the middle of the internodes assumes a hollow form, like a piece of metal plate when beaten out in the middle. This might happen if the internodes, like the metal plate, were free underneath; but as its under surface is continuous with the already more developed and more solid tissue of the subjacent internodes, a predominant development of cells in its centre would, to keep to Schleiden's comparison, no more render it hollow, than hammering a plate of metal, soldered to a block, would form it into a bowl. Cell-development predominant in the middle of the internode could only cause its expansion upwards, thus producing the opposite of what Schleiden expected. It is easily seen that such expansion of the *punctum vegetationis* is a consequence of just the opposite condition,—that the development of cells at the circumference is in excess, and the cells in the middle are further behind in their development—this stage being followed by a second period of growth, in which the cells of the centre extend longitudinally, whereby the meniscus form of the internodes is converted into a discoid, and the inwardly-curved surface of the stem is curved outwards and converted into a cylinder, as has been demonstrated most convincingly by Hofmeister in the depressed summits of the stems of Ferns.

Schleiden does not extend his researches (except in the case of *Dracæna*) to the examination of the question how the cambium-layer behaves in the stem after the unfolding of the bud, and what becomes of it in the full-grown stem, of the Monocotyledons. This point was taken up by Karsten ('Vegetationsorgane der Palmen,' 1847). This author had the great advantage, in his investigations made in the tropics, of possessing abundant material, consisting of living and entire plants,—an advantage which no one knows better how to value than myself, since, in my 'Anatomy of the Palms,' I was restricted for the most part to isolated fragments of stems.

Karsten explains most clearly how, in the terminal bud of the Monocotyledons, especially of the Palms, the wood-bundles take their origin in the cambial tissue of a hollow cone, the cambium of the latter becoming converted in some places into parenchyma, in others into the vascular-bundle tissue. With the progressive development of the bud into a stem, the hollow cone assumes at its lower end a cylindrical form. The increase of the cambium endures in it for some time, while its outer, and more particularly its inner surface, are simultaneously converted into parenchyma—certain portions of the cambial cells at the same time separating as it were from the parenchyma and becoming developed into the woody bundles running into the medulla, and in some plants also into the rind. After the various parts of the stem have thus been produced from the cambium-cone, the cell-producing energy is lost in the latter (except in the case of the *Dracæna*), and the last remnants of the cambium undergo a transformation into a layer organized somewhat differently in different plants, which, in the full-grown stem, lies between the internal vascular bundles and the rind, and is termed by Karsten the wood-cylinder. In the Palms the cells of this wood-cylinder agree closely with the cells of the rind and of the medulla; and in this way originates a tissue, analogous to the medullary rays of the Dicotyledons, connecting the medulla and the rind. The same condition occurs in the Pandaneæ, Aroideæ, Orchideæ, and Grasses. In other plants the cells of the outermost layers of the cambium assume forms which differ essentially from those of the cells of the rind and medulla, especially by the great thickening of their walls (lignification), and form a boundary-layer between the medulla and rind, often consisting only of two strata of cells. The forms of these cells are varied: where the inferior terminations of the vascular bundles are connected together to form a reticulation, the cells are parenchymatous; where the vascular bundles have a parallel course, they are more or less prosenchymatous. The lignification of these cells induced Karsten to name the layer they form the woody layer (*Holzschicht*),

without intending to indicate the import of the lignified tissue, as to whether its cells were wood-cells or liber-cells (p. 100). In *Dracæna* and allied plants, the cell-forming activity of the cambium is not exhausted by this conversion into lignified cells, but endures during the whole life of the stem, and gives rise to the production of woody layers, as in the Dicotyledons,—the bundles of which must not, however, be regarded as the inferior prolongations of the new vascular bundles formed above (p. 99), but may be compared with the annual rings of the Dicotyledons (p. 103).

In this interpretation of the boundary-line between medullary and cortical tissue, distinctly marked in many Monocotyledons, but altogether imperceptible in others, as a wood-cylinder, two questions arise:—whether this boundary-layer, composed of homogeneous cellular tissue, is to be compared with the fibrous layer of *Dracæna*, which is continually thickened throughout life; and whether this last structure corresponds to the annual rings of the Dicotyledons.

There is no doubt that the said boundary-line is formed in the Grasses, *Asparagus*, *Ruscus*, *Iris*, &c., in the following way: that in the cambium-layer, the further it is developed outwards, and the more the formation in it of vascular bundles approaches its close, the production of the medullary parenchyma-cells side by side with the bundles undergoes an alteration—the cells, as they come to lie more externally, becoming of smaller diameter and mostly of greater length, until the formation of new cells at last entirely ceases. In the first place, in spite of the outermost of these cells having far thicker walls and a much greater length than the inner medullary cells and the cells of the rind, they are no analogue of the wood, but merely a modification of the medullary parenchyma: and this is the more clear since the difference of length and thickness of the walls is by no means a constant character; for, as Karsten truly remarks, in the Palms this layer of cells cannot be distinguished from the cells of the medulla and rind. We find similar conditions recurring when we examine the corresponding region of the Dicotyledons. In trees we usually find the same condition as in Palms, the cellular tissue of their medullary rays passing into the cellular tissue of the bark without displaying essential variations in the organization of the cells; and the only distinction existing is, that at the limit between medulla and rind, the cells are capable of multiplying by division. In other Dicotyledons, on the contrary, we find a sharp line of demarcation between medullary and cortical parenchyma, similar to that in the rhizome of *Iris*, &c., and indeed with the same peculiarity, that the boundary-line lies a little outside the circle of vascular bundles,

and the production of new cells in the boundary-layer is altogether at an end, as in the Monocotyledons. This is the case particularly in the stems of *Cucurbita*, *Cucumis*, *Lagenaria*, &c., also in the stems of *Basella alba* and *B. rubra*. Here also, as in the Monocotyledons, we find, instead of a cambium-layer connecting the cambium-regions of all the separate vascular bundles into a general closed cylinder, a defined external boundary to the medullary tissue, which undergoes no further alteration with time. How little indicative is the distinction between this structure of the stem and that of an uninterrupted passage from medulla into rind, is shown by the portions of the same stem situated below the cotyledons, where, in *Basella*, the boundary-region just referred to is certainly in some degree marked, by its cells being of somewhat less diameter than those of the rind and medulla, yet forming no definite boundary-line,—while in the cotyledonary internode of the Cucurbitaceæ mentioned above, the cellular tissue of the rind and medulla is of quite uniform structure, and no trace can be found of any line of demarcation between them. Under these circumstances, it does not seem warrantable to apply to the peripheral region of the medullary parenchyma, formed last out of the cambium of the Monocotyledons, the term ‘wood-cylinder,’ since (not to dwell upon the vessels in this situation) a portion of the stem to which the name of wood should apply, ought to present at least a decided contrast to the parenchyma of the stem; here, however, such a contrast either has no existence, or depends on mere thickening of the walls of parenchymatous cells, or upon a slight alteration of form (elongation) of the medullary cells, which takes place with a gradual transition. These boundary-cells are structures of arrest or limitation (*Hemmungsbildung*), with which the medullary cells cease their reproduction on the outer side.

The case is different in *Dracæna*. Here the formation of new tissue does not cease; the product of the continuously developed cambium-layer, however, does not consist of mere parenchyma-cells, but, as in the antecedent formation of the vascular bundles, of two kinds of tissue—parenchyma-cells and fibrous bundles. Here there exists a clear analogy to the normal formation of the wood of Monocotyledons, although the bundles are imperfect, containing no vessels. In accordance with the type of the Monocotyledonous stem, the new layers of wood are not formed in continuous concentric layers, but in the form of isolated, although freely anastomosing, bundles. If, with Karsten, we apply the name wood-cylinder to these external bundles, the essential difference of their organization is a reason for not extending the name to the boundary-layer of the other Monocotyledons consisting simply of cellular tissue; for in the latter the formative

energy of the cambium is lost before it arrives at a condition to form the wood-cylinder. In my 'Anatomy of Palms,' I took these outer vascular bundles of *Dracæna* for the lower ends of the bundles belonging to the leaves above, and Unger* was led by his investigations to agree with this; but I now think that Karsten was right in stating this view to be erroneous. The comparison made by Karsten (p. 103) between these outer bundles and the annual rings of the Dicotyledons is less admissible, since the latter, especially in our native trees, owe their origin chiefly to the further development of the cambium situated upon the individual primary vascular bundles between the wood and the liber, and therefore are of essentially different derivation from the outer vascular bundles of the *Dracæna*. More satisfactory would be the comparison of these vascular bundles with those layers of wood which, in many Dicotyledons with widely diffused bundles, as in the Balsamineæ, are developed from that part of the cambium-layer which lies between the primary vascular bundles; and still more apt is the comparison with those external woody bundles of the Nyctagineæ, Chenopodeæ, &c., sometimes arranged in concentric circles, and sometimes confounded into more or less irregularly arranged masses, which Unger has so beautifully investigated, and which, in like manner, have no relations with the leaves. Doubtless many analogies might be made out between the organization of the stem of the *Dracæna* and that of the stems of many tropical climbers; but as I have no opportunity myself of following out the development of the latter forms, I shall not enter upon this point. The outer bundles of the *Dracæna* contain no vessels, their elementary organs corresponding rather with those of which the liber-bundles of the Monocotyledons are composed. Hence it may appear doubtful whether they are comparable at all with the vascular bundles; but this objection appears of small weight when we bear in mind that the same anatomical characters are frequently found in the lower portions of all the vascular bundles of Monocotyledonous plants. In fact, this circumstance was one of the reasons for my regarding these bundles as the inferior prolongations of those bundles passing out into the leaves higher up in the stem.

Schacht attempted to extend the theory of the cambium-ring and its development into wood by setting up a series of special laws (while he coincided in general with Karsten's views), in obedience to which the development of the different portions of the stem should take place. Whether his attempt was a fortunate one, will appear from the sequel.

One of the most general of these laws ('Pflanzenzelle,' p. 255)

* Bau u. Wachsthum d. Dikot. Stammes, p. 37.

asserts that the vascular bundles originate in the primary parenchyma (*Urparenchyma*) of the embryo, and increase in number solely by ramification, and that no new independent vascular bundles can be formed in the plant.

The dogma thus generally expressed is decidedly erroneous. We may admit it for the vascular bundles belonging to one axis, originating by the development of a common connected cambium-sheath: for no one now entertains any doubt of the want of foundation of the view of Du Petit Thouars and his followers, that the vascular bundles originate in the leaves and run down in the stem to the points of the roots; for the vascular bundles entering the leaves from the stem are developed from below upwards. But it is another question, and, as it appears to me, one not yet solved by existing researches, whether in all plants the primary vascular bundles lying at the circumference of the pith are connected together, or whether there do not exist plants in which the young vascular bundles which run to leaves situated higher up, are formed between the older, without entering into connexion with them, and whether the mutual connexion of them is not effected by the subsequently produced woody layers. We shall, however, leave this point out of consideration.

On the other hand, there can be no doubt that the roots of Monocotyledonous stems possess their own bundles, which only subsequently enter into connexion with the vascular bundles of the stem, and (at least in many cases) cannot be derived from the same cambium-layer which was the place of origin of the latter. The Palms and Pandanæ are the most favourable plants for the investigation of these conditions. In the former, the observations of myself, Mirbel, and Karsten agree that the roots originate under the rind, in that layer of the stem through which the most external fibrous bundles run—therefore in a layer where, in a fully developed Palm-stem, no peripheral cambium-layer any longer exists. Here there is formed locally for each root a nucleus of new cambium-tissue, by the transformation of parenchyma-cells existing long before; and in these nuclei originate the vascular bundles, which on the one side grow forward with the roots and form the wood of the roots, well known to be very different from the vascular bundles of the stem,—on the other side spreading out like a tuft, and penetrating an inch deep into the parenchyma of the stem, become entangled with the vascular bundles of the stem, and apply their extremities upon them. One must of course give up any idea that these vascular bundles grow into the cellular tissue of the stem in the manner of a root growing into the earth; they can only be formed by the transformation of particular portions of the parenchyma of the stem into cambial tissue, and the development of the latter

into vascular bundles. But they are decidedly new structures, and not prolongations or ramifications of the vascular bundles of the stem.

The branches of the roots of the Monocotyledons stand in the same relation to the roots as the latter do to the stem, since they are developed outside a cambium-cylinder which has ceased to develop, and their ramifications penetrate backwards between the vascular bundles of the root. Schacht (p. 101) denies that the roots of Monocotyledons produce new branches, if their cambium-cylinder is lignified early; but this is untrue, and he should have paid attention to what has been said on this subject by Karsten (p. 56), who was supported by totally different experience. The origin of the thick adventitious roots of *Pandanus* presents conditions analogous to that of the Palms; and Schacht (p. 320) is wrong in ascribing to their stems a continuously developed cambium-layer such as occurs in *Dracæna*.

Less evident, and, particularly in the Dicotyledons, less convincing on account of the presence of an active cambium-layer in which the adventitious roots originate, is the condition of the roots of herbaceous Monocotyledons and the radical branches and adventitious roots of the Dicotyledons, in which the earliest vessels belonging to the root appear in the form of a wreath of vessels, and lie upon the lateral surfaces of the subjacent vascular bundles; but Trécul* was right in regarding the circumstance that these vessels are not continuous with the vessels of the stem or of the roots from which the new roots arise, as a proof that the adventitious roots possess vessels of their own.

With regard to adventitious buds, also, it may be proved that they form their own system of vascular bundles. The evidence is indeed not striking in the common cases where the adventitious buds form in the cambium-layer of the Dicotyledons, on which account I shall not dwell upon this subject, so well investigated by Trécul (*l. c.* p. 268). Perfect proof can only be afforded by those adventitious buds which originate in fully-developed cellular tissue at a distance from the cambium-layer of the parent plant, in which case there can be no doubt of the origin of their vascular bundles. Trécul (p. 280) observed one case of this in fragments of the roots of *Ailanthus*, in which adventitious roots had been formed outside the liber-layer: these stood in connexion with the cambium-layer of the stem by means of vessels which appeared to be younger than those contained in the bud. We cannot indeed attribute perfect conclusiveness to this observation, since it did not include the earlier stages of development, and only shows the probability, but not the certainty, of the independent development of the vascular bundles

* Ann. des Sc. Nat. 3 sér. viii. p. 290.

in the buds; but in the adventitious buds of *Begonia phyllo-manica* it is beyond all doubt that the vascular bundles are developed quite independently of the cambium-layer of the stem. These buds originate in the outermost layer of the rind, and are separated from the cambium-layer by the entire, perfectly unaltered cellular tissue of the rind—at times, when they have already formed air-bearing spiral vessels in their axes and leaves.

The dogma that vascular bundles can only originate by the ramification of other vascular bundles, is therefore decidedly false.

Another axiom set forth by Schacht is, that only those vascular bundles whose cambium-layers coincide with the general cambium-layer of the stem can become thickened in the radial direction. Schacht on this account applies to the cambium-layer the name of thickening-ring (*Verdickungsring*), and attributes the incapacity of the Monocotyledons to increase in thickness to the want of this coincidence.

This idea also I must declare to be erroneous. I mentioned above that in the stems of *Cucurbita*, *Cucumis*, &c., and *Basella*, the vascular bundles lie inside the medullary parenchyma; in young stems there is no trace of a cambium-ring connecting them; but this does not prevent the vascular bundles from growing very considerably in thickness, in the same manner as in other Dicotyledons. This would cause the rupture of the cellular tissue, comparable to medullary rays, lying between the vascular bundles, were it not that a secondary cambium-layer is formed, in consequence of this increasing thickness of the vascular bundles, by the division of the parenchymatous medullary cells between the latter, which renders possible the elongation outwards of the medullary rays. Here it is very evident that the vessels do not increase in thickness because they lie in a cambium-layer, but, on the contrary, a cambium-layer is subsequently formed on account of the thickening of the bundles.

A secondary cambium-layer may be formed not only in a direction parallel to the surface of the stem, but a similar phænomenon may occur in a transverse direction across the whole thickness of the stem, and then give rise to the formation of vascular bundles, which subsequently apply themselves to the bundles already formed from the cambial sheath of the stem. This occurs in the nodes containing a vascular plexus both of the Monocotyledons (for instance Grasses) and Dicotyledons (*e. g. Ricinus*). A longitudinal section through the terminal bud of these plants shows that these nodes originate at a relatively late period; for no indication of them can be found in the internal cellular tissue of the axis of the bud, and the medullary cellular tissue of the latter consists of uniform, re-

cently-developed parenchyma. Some distance down only does it fall into transverse lamellæ, which are mostly convex downwards, and which, on account of the far more vigorous development of the intercellular passages containing air, appear alternately bright and dark, and of which the one set of strata corresponds to the future nodes and the other to the internodes. About this time the vascular bundles of the stem are developed in the cambium-sheath; and the cellular tissue of the medulla has lost the transparency of cambium, on account of the intercellular passages. Then only is formed, in the lamellæ corresponding to the nodes, a secondary cambium, in consequence of which the cambial tissue re-assumes its transparency; and in this cambium are developed the much-entangled vascular bundles which become interwoven with the vascular bundles of the stem.

Lastly, a third law enunciated by Schacht says that no new vascular bundles are formed in the cambium-ring of the Dicotyledons, but this is only in a condition to form parenchyma-cells, while the formation of wood-, liber-, and vascular-cells only proceeds from the cambium of the wood-bundles (p. 251). This axiom, which Schacht founded chiefly on the examination of the stem of *Urtica dioica*, is equally untenable with the foregoing. The ordinary organization of our native trees is even opposed to this. As is well known, the medullary rays run through the whole internode, longitudinally, between the vascular bundles in the young shoots of these, while the woody layers subsequently formed by the lateral ramification of the vascular bundles stand in connexion, and the medullary rings then only fill up the short meshes of the reticulation. This ramification of the vascular bundles running over the original medullary rays can only be brought about by a part of the cells of the medullary rays becoming transformed into wood-cells and vascular tubes, and converted into woody bundles, which, uniting with the product of the cambium-layer lying in the vascular bundles, form the connected secondary woody layers. But there are still more striking instances. I will not refer to the observations on tropical climbers made by others, since I cannot test them, and shall only call attention to one among the observations on this point made by Karsten (p. 140) on *Bannisteria nigrescens*, as this appears to me particularly convincing. In this, Karsten found that woody portions, presenting themselves in the form of rounded-off radii strongly projecting at the circumference of the wood, are not produced by the development of the primary vascular bundles, but consist of wood-bundles formed over the medullary rays. We may ascertain, even in plants which are at our disposal in a fresh state, that the medullary rays have the power to form woody bundles. This occurs in such plants as

have the vascular bundles lying in the cambium-cylinder separated by very broad medullary rays. If we trace, for instance, the development of the stem of an *Impatiens*, we see that the cells of the medullary rays produced by the development of the cambium-ring become converted more and more into prosenchymatous cells, and that between them appear groups of vessels (but without spiral vessels), thus giving origin to new vascular bundles. Hartig* observed vascular bundles developed in the above-described secondary cambium-layer which appears in the medulla of *Cucurbita*.

XLI.—On Additions to the *Madeiran Coleoptera*.

By T. VERNON WOLLASTON, M.A., F.L.S.

Fam. Carabidæ.

Genus OLISTHOPUS, Dej.

Olisthopus humerosus, n. sp.

Olisthopus maderensis, var. β , Woll. Ins. Mad. 35 (1854).

— *humerosus*, Schaum, in litt.

It is not without some little hesitation that I am induced to register the present insect as specifically distinct from the *O. maderensis*, of which I have hitherto regarded it as an insular modification (although certainly a very curious one) peculiar to the rocks of the Dezertas. And I may add that it is through the strongly expressed opinion of my friend Dr. Schaum of Berlin, who has stated his belief that the peculiarities which it exhibits are too great to be attributed to any combination of the local influences to which it may have been long exposed, that I now record it under the new trivial name which he has suggested,—a title indicative of a character about its shoulders, which are a trifle more produced (and angular) than those of the *O. maderensis*. The other points in which it recedes from its ally may be at once gathered by a reference to the ‘*Insecta Maderensia*.’

Genus STENOLOPHUS, Meg.

Stenolophus marginatus.

Stenolophus marginatus, Dej. Spéc. gén. des Col. iv. 427 (1829).

— —, Léon Fairm. Faun. Ent. Franç. i. 145 (1854).

Two Madeiran specimens of this insect have lately come under my notice; they were both captured near Funchal, one by Mr. M. Park, and the other by Mr. E. Leacock. The species

* Bot. Zeitung, 1854, p. 31.

may be at once known from the *S. Teutonius* by (*inter alia*) its rather smaller size and totally different hue, its upper surface being of a dull metallic green—except the suture and the extreme margins of the elytra and prothorax, which are paler. It has been recorded as occurring in Spain, the south of France, Corfu, Greece, and Egypt; and I have myself taken it in the island of Grand Canary.

Fam. Lathridiadae.

Genus CORTICARIA, Mshm.

Corticaria maculosa, n. sp.

C. elongato-ovata, fulvo-ferruginea, pubescens; capite prothoraceque profunde punctatis, hoc ad latera crenulato, fovea postmedia minus profunda impresso; elytris substriato-punctatis, macula nigra postmedia plus minus distincta in singulo ornatis; antennis apicem versus obscurioribus.

Long. corp. lin. $1-1\frac{1}{8}$.

C. elongate-ovate, pale fulvo- or rufo-ferruginous, pubescent, and slightly shining. *Head* and *prothorax* beset with large but not very close punctures; the *latter* with the edges rather distinctly crenulated behind, and with the post-medial fovea round and distinct, but not very deep. *Elytra* substriate-punctate, and with a more or less apparent black patch on the hinder disk of each, and occasionally with a very obscure cloud towards the base of each, a little behind the scutellum. *Antennae* rather dusky towards their apex.

N.B. In some specimens (especially immature ones) the elytral patches are entirely obsolete, under which circumstances the insect is wholly ferruginous.

Five specimens of the present *Corticaria* were captured by myself in Madeira proper during the summer of 1855; but, as they happened to be somewhat immature (and with the spots therefore but faintly expressed), I had confounded them with the *C. fulva*, of which I imagined them to be examples in which the pubescence was rather less developed than usual. Having, however, lately detected a mature and highly coloured one in the collection of Mr. M. Park, I at once recognized it as identical with a species which I have been recently taking in the Canarian Group; and this naturally led me to re-examine my supposed individuals of *fulva*, amongst which I then readily perceived the five above-mentioned specimens of what I now characterize as a new and very interesting species. It is the only *Corticaria* that I have yet seen in which there is any indication of distinct patches of colouring; but whether it may be identical with the *C. macularis*, Fuss, of the European Catalogues (as the name

might lead us to suspect), I have no means of ascertaining. Mr. Park's example was captured crawling on the outside of a house in Funchal; and my own were taken partly in the garden of the Quinta da Favilla (also near Funchal), and partly at Camacha. In the Canaries the species is by no means uncommon; and I have it from, I believe, *five* (out of the seven) islands of the group. At first sight it very much resembles the *C. fulva*, Mann.; but the prothoracic fovea is not quite so deep, and the elytra are a trifle less ovate, with their pubescence shorter, and with a more or less conspicuous black patch on the hinder disk of each. Sometimes, however, this patch is entirely obsolete; and occasionally, in highly coloured specimens, there is a very obscure indication of an additional dark cloud (or transverse dash) towards the base of each, adjoining the suture, a little behind the scutellum.

Genus LATHRIDIUS, Hbst.

Lathridius delectus, n. sp.

L. elongatus, angustus, ferrugineus; capite prothoraceque profunde rugoso-punctatis, illo sat magno subquadrato, hoc subquadrato basi leviter angustato; elytris parallelis, profunde seriatim punctatis (punctis magnis), sutura interstitiisque alternis fortiter elevatis. Long. corp. lin. $\frac{3}{4}$.

L. elongate, narrow, nearly opaque, and reddish ferruginous. *Head* and *prothorax* deeply and roughly punctured; the former rather large and subquadrate, being a little narrowed anteriorly, and about as wide behind as the front of the *prothorax*, which is also subquadrate, and rather narrowed posteriorly. *Elytra* with the sides parallel, closely and regularly seriate-punctate (the punctures being extremely large), and with the suture and alternate interstices greatly elevated, forming longitudinal costæ. *Limbs* concolorous.

The discovery of the present little *Lathridius* (which differs from all the European species which I have been able to examine) is due to Mr. M. Park, who captured a single specimen (which he has since presented to the Collection of the British Museum) near Funchal. It is of about the size and general aspect of the *L. filiformis*, Gyll., though its deep sculpture and greatly raised elytral costæ will at once distinguish it from that insect.

Fam. Cissidæ.

Genus RHYZOPERTHA, Steph.

Rhyzopertha bifoveolata, n. sp.

R. breviter cylindrica, piceo-ferruginea, subopaca; prothorace magno,

subgloboso, valde convexo, scabroso, necnon antice mucronibus fortiter asperato, ad basin foveolis duabus mediis impresso; elytris ubique confertim punctatis (haud striatis), ad apicem integris; antennis longiusculis, robustis.

Long. corp. lin. vix $1\frac{2}{3}$.

R. rather larger and broader than the common *R. pusilla*, but proportionably not quite so long; a little darker (or more piceous), and nearly opaque. *Prothorax* much larger and more globose than in that insect, being exceedingly convex, wider and more roughened in front, and with two deep, rounded foveæ or depressions (separated only by a narrow, rudimentary dorsal line) in the centre behind. *Elytra* uniformly and closely punctured all over, the punctures being much smaller and more numerous than those of the *R. pusilla*, and without any tendency to be arranged either in striæ or longitudinal rows; rounded and entire at the apex, where there is no appearance of an oblique truncation. *Antennæ* a little paler than the rest of the surface, and rather longer and more robust than in the *R. pusilla*.

The eight specimens from which the above description has been compiled were taken by Mr. M. Park in Funchal, and, as he believes, in company with the *Adelina farinaria*, in a cask of American(?) flour which had remained upwards of a year in the Custom-House, and had become bad. Hence, like the *Adelina*, it is evident that the present beetle cannot be strictly regarded as Madeiran; nevertheless, since by such modes of importation species become gradually naturalized, it seems desirable that all introductions should at any rate be admitted into our Catalogue, as serving to point out at what period their importation first took place. In the present instance, however, it appears highly probable that neither of the insects alluded to has as yet been described; which, if it be true, affords an additional reason for now characterizing them.

Fam. Curculionidæ.

Genus RHYNCOLUS, Germ.

Rhyncolus capitulum, n. sp.

R. angustus, cylindricus, nigro-piceus; prothorace profunde punctato (punctis magnis); elytris profunde punctato-striatis; antennis brevibus, rufo-piceis, capitulo parvo, subgloboso.

Long. corp. lin. $1\frac{3}{4}$.

R. narrow and cylindrical (being of almost equal breadth throughout), dark piceous, and but very slightly shining. *Rostrium* short, broad, and very rugosely punctured; without any

central keel, but with a very short, small, and obscure foveolet in the centre, between the insertion of the antennæ. *Prothorax* very deeply punctured (the punctures being large, and not nearly so numerous as in the *R. tenax*), and without any indication of a central keel; ovate, but truncated behind, being broadest just before the extreme base. *Elytra* very deeply punctate-striated (the punctures being large), and with the interstices most minutely punctulated. *Legs* concolorous with (or perhaps a little darker than) the rest of the surface. *Antennæ* paler (being bright rufo-piceous), and short, with their club much smaller and more globose than that of the *R. tenax*.

The single specimen from which the above description has been compiled was taken near Funchal by Mr. M. Park. Its comparatively narrow and very cylindric outline and deeply sculptured surface, in conjunction with its darker and unmetallic hue, its unkeeled rostrum, and its shorter antennæ (which have their club much smaller and more globose than is the case in that species), will at once distinguish it from its only Madeiran ally, the *R. tenax*.

Fam. Cerambycidae.

Genus OBRIMUM, Meg.

Obrimum brunneum.

Saperda brunnea, Fab. Ent. Syst. i. ii. 316 (1792).

Obrimum minutum, Steph. Ill. Brit. Ent. iv. 250 (1831).

— *brunneum*, Muls. Longic. de France, 99 (1840).

— —, Redt. Fna Austr. 490 (1849).

A solitary example of the common little *O. brunneum* of Europe was captured lately by Mr. M. Park near Funchal. It is an insect widely distributed, being especially attached to all kinds of wicker- and basket-work, on the dry wood and sticks of which it feeds; so that it is peculiarly liable to accidental importation. I have taken it abundantly in the island of Palma, of the Canaries, emerging from its perforations on the sides of the light open trays in which silkworms are fed.

Fam. Erotylidæ.

Genus EUXESTUS, nov. gen.

Corpus parvum, oblongo-ellipticum, glaberrimum, politum, *Olibri* formam simulans sed ab eo affinitate longe distans: *prothorace* transverso, postice lato subsinuato elytris arcte applicato; *prosterno* inter pedes anticos late longitudinaliter elevato, lobum subtriangularem antice evanescentem efficiente: *mesosterno* angustissimo; *scutello* parvo, scutiformi: *metasterno* maximo, antice et postice integro, truncato; *alis* amplis, hinc inde parce nebulosis, fere nervulis carentibus: *abdomine* e segmentis 5 composito. *Antennæ* capitatae,

capitis prothoracisque vix longitudine, articulo 1^{mo} robustissimo valde inflato subgloboso, 2^{do} minore, 3^{tho} huic graciliore sed elongato (forsan duorum inter se arete conjunctorum composito), 4 sequentibus (*i. e.* usque ad capitulum) latitudine leviter crescentibus, capitulo magno solidissimo subgloboso ex articulis duobus vel tribus (1^{mo} multo majore) inter se arete compressis formato. *Labrum* transversum, antice vix emarginatum submembranaceum ciliatum. *Mandibula* triangulares corneæ, ad apicem incurvæ latiusculæ tridentatæ, margine interno arcuato-emarginato et membrana robusta aucto. *Maxillæ* bilobæ, lobis angustulis subrectis; *interno* externo paulo brevior, intus ciliato. *Palpi* subfusiformes: *maxillares* art. 1^{mo} parvo, 2^{do} 3^{tho}que (illo præcipue) majoribus crassioribus, ultimo elongato fusiformi basi truncato: *labiales* art. 1^{mo} parvo, 2^{do} magno crassiore, ultimo huic vix angustiore fusiformi basi truncato. *Mentum* corneum transversum, antice paulo angustatum et leviter emarginatum. *Ligula* longiuscula, apice membranacea pubescens. *Pedes* breves, subcontractiles, *antici* leviter *posteriores* valde distantes: *tibiis* compressis, apicem versus paulo dilatatis: *tarsis* 4-(?)articulatis; art. 1^{mo} magno, subtus in lobum elongatum pubescentem producto, duobus (vix tribus, ut mihi videtur) sequentibus minutis simplicibus, ultimo elongato *unguiculis* simplicibus munito.

Ab *εὖ* bene, et *ξεστὸς* politus.

For an opportunity of carefully examining the oral organs of the curious little beetle from which the above generic diagnosis has been compiled, I am indebted to Mr. Westwood, who has succeeded most admirably in dissecting it, and has furnished me with an excellent drawing both of the entire insect and its various parts. The rather obscure structure, however, of some of its details, in conjunction with their small size, has rendered it difficult to pronounce positively on one or two of them. Thus, I am as much at a loss as Mr. Westwood is to determine whether the third articulation of its antennæ may not be composed of *two* joints closely soldered together, as also whether the club is in reality made up of two or three. Again, it is open to inquiry whether there may not be *three* minute joints in the feet (instead of two) between the large basal one and the terminal; for the highest powers of the microscope have been hitherto insufficient to convince either Mr. Westwood or myself of this for certain. Be these few points, however, settled (ultimately) as they may, there can be but little doubt, I think, that the insect is allied to *Engis*, and must be referred therefore to the *Erotylidæ*. Its general aspect, indeed, is strongly suggestive of *Engis*, whilst its upper and lower lips, mandibles, maxillæ, and sterna are extremely similar to (though not actually identical with) those of that genus; in the singular construction of its feet, however, and its very solid antennal club, it differs from *Engis* essentially, whilst in its habits, which appear to be Myrmecophilous, it offers another most remarkable peculiarity.

Euxestus Parkii.

E. rufo-castanea, nitidissima, glaberrima; antennis pedibusque paulo pallidioribus.

Long. corp. lin. $1-1\frac{1}{8}$.

E. oblong-elliptic, bright reddish chestnut, highly polished, totally free from pubescence, and appearing, except under a high magnifying power, almost impunctate; but when viewed beneath a powerful lens, the entire surface will be seen to be beset with small but remote punctures. *Prothorax* with the hinder margin slightly sinuated. *Limbs* a little paler than the rest of the surface, being reddish testaceous.

The discovery of this insect, which so curiously recalls at first sight the common *Olibrus liquidus*, is due to the indefatigable researches of Mr. M. Park, to whom I have great pleasure in dedicating the species. Three specimens of it, one of which he has presented to the British Museum (the second being in his own possession, and the third having been destroyed for dissection), were captured by him in an ant's nest, in Dr. Lister's garden, at Funchal.

Fam. Tenebrionidæ.

Genus ADELINA, Chevr. (ined.).

Corpus oblongum vel lineare, valde depressum: *prothorace* transverso-subquadrato; *prosterno* postice inter pedes anticos lobato: *metasterno* postice bifido; *alis* amplissimis, læte nebulosis: *abdomine* e segmentis 5 composito. *Antennæ* longiusculæ (capite prothoraceque conjunctim paulo longiores), ante oculos sub margine clypei insertæ, apicem versus moniliformes sed vix incrassatæ; art. 1^{mo} reliquis haud robustiore, 2^{do} brevi, 3^{tio} longiusculo, ultimo subgloboso. *Labrum* transversum, antice rotundatum pilosum. *Mandibulæ* validæ corneæ triangulares, in medio profunde fisso-sinuatæ, una membrana aucta necnon ad apicem bifida. *Maxillæ* bilobæ, lobis pubescentibus; *interno* parvo angusto brevi, ad apicem ipsum acutissime uncinato. *Palpi* clavati; *maxillares* art. 1^{mo} parvo, 2^{do} 3^{tio}que majoribus crassioribus, ultimo magno crasso securiformi; *labiales* art. 1^{mo} curvato, 2^{do} huic paulo brevior sed latiore, subpoculiformi extus leviter producto, ultimo multo longiore crassiore, subfusiformi ad apicem oblique truncato. *Mentum* transverso-quadratum, basi leviter angustatum, apice integrum submembranaceum et ibidem in medio (ut mihi videtur) lobo elongatissimo subcorneo (ad apicem acuto), inter palpos et forsàn ligulæ connato, auctum. *Ligula* membranacea, antice dilatata rotundata ciliata. *Pedes* graciles, longiusculi: *tibiis* subtilissime pubescentibus, per marginem anteriorem obscurissime subcrenatis, ad apicem internum breviter calcaratis: *tarsis* heteromeris; *posterioribus* (sed præsertim *posticis*) art. 1^{mo} longiusculo.

Although the present genus has been long recognized, I give

the above structural details of it in full, because I believe they have never yet been published. I need scarcely add, however, that they are drawn out entirely from the insect described below; consequently if it should happen that the *A. farinaria* is not strictly congeneric with the species which have been usually regarded as *Adelinae*, it follows as a necessity (if indeed my conclusion is correct, that the group has not yet been characterized) that the latter will eventually require a new name. I would call attention to this, because, having lately had an opportunity of examining superficially several representatives of *Adelina* in the Collection of the British Museum, they appeared to me to offer sufficient external differences from the Madeiran insect to warrant a suspicion that a careful dissection of them might perhaps bring *structural* characters to light distinct from those from which the above diagnosis has been compiled. Nevertheless, since this is only a conjecture, and since it is the opinion of my friend Dr. Schaum of Berlin that the Madeiran beetle is truly an *Adelina*, I have not hesitated to regard it as such, and have drawn out my generic details from it accordingly.

Adelina farinaria, n. sp.

A. oblonga, rufo-picea, nitida, valde depressa; capite prothoraceque confertim leviter punctulatis, hoc transverso, postice foveolis duabus brevibus longitudinaliter impresso, per marginem posticum sinuato; elytris punctato-striatis, interstitiis subtilissime punctulatis.

Long. corp. lin. 3.

Variat (immatura) colore pallido-ferrugineo.

A. oblong and greatly depressed, shining and glabrous, and (when mature) of a bright rufo-piceous hue; when immature, pale ferruginous. *Head* and *prothorax* closely and rather finely punctulated: the *clypeus* of the former uneven, and a good deal thickened and elevated about its margin, especially over the insertion of the antennæ: the *latter* squarish-transverse, with the sides a little rounded, and impressed behind with two very short and rather obscure longitudinal foveæ; the portion between these foveæ a little lobed (or produced backwards in front of the scutellum), causing the posterior margin to be slightly sinuated. *Elytra* rather lightly punctate-striated, and with the interstices most minutely and somewhat sparingly punctulated. *Limbs* usually concolorous with the rest of the surface.

As already implied in my observations under *Rhyzopertha bifoveolata*, the present insect can only be admitted into the Madeiran Catalogue as an *imported* one. Nevertheless it falls into the same category with many others (such as *Cerandria*,

Tribolium, *Tenebrio*, *Alphitobius*, *Trogosita*, &c.) which have become gradually naturalized through the direct agency of commerce, and it cannot therefore be properly ignored. As above stated, several specimens of it were captured by Mr. M. Park in a cask of bad flour (he believes American) which had remained for more than a year in the Custom-House at Funchal.

Fam. Anthicidæ.

Genus OCHTHENOMUS, Schmidt.

Ochthenomus punctatus.

Ochthenomus punctatus, Dej. Cat. des Col. 239 (1837).

— —, Laferté, Mon. des Anth. 283 (1848).

— —, Lucas, Col. de l'Algérie, 380 (1849).

A single specimen of this insect was captured by Mr. M. Park beneath a stone, in the Ribeira de S^{ta} Luzia, near Funchal. Since it belongs to a genus new to the Madeiran fauna, it may be as well to state that the *Ochthenomi* are insects of Mediterranean latitudes, and apparently but few in number. They may be known from the true *Anthici* by the very peculiar structure of their upper surface, which is coriaceous and opaque, and is densely beset with excessively short and stiff silvery hairs, which have the appearance of very minute scales. Their limbs are elongated and slender; their head oblong and more or less rectangular, being generally a little wider than (and about as long as) the prothorax, from which it is detached by a very evident and narrow neck; and their eyes are smaller and less prominent, and the penultimate joint of their maxillary palpi is rather longer and less transverse, than is the case in *Anthicus* proper. The *O. punctatus* is recorded as occurring in Spain, the south of France, Sardinia, and Algeria; and I have taken a closely allied species in the island of Palma of the Canaries.

Such are the ten additions which I have been enabled, principally through the successful researches of Mr. M. Park (to whom the discovery of no less than seven of them are due), to make to the Madeiran Coleoptera during the past year. In January last I had to record (vide 'Annals,' ser. ii. vol. xx. pp. 504, 505) three species which were not included in my then recently published Catalogue, which raised the entire number (from 580) to 583. Even that, however, is now still further increased,—the species which have been observed in the Madeiras up to the present date (*i. e.* October 1858) amounting to 593.

XLII.—On a species of Pipe-fish (*Syngnathus æquoreus* ?) lately found at Scarborough. By J. LECKENBY, Esq.

[With a Plate.]

IN the month of June of the present year, a fisherman brought to the Scarborough Museum a Pipe-fish alive, which he stated had just been captured in a lobster-trap. It was placed in the aquarium of the Museum, where it lived more than a month. At first it appeared uneasy and restless; but after a fine plant of *Halidrys siliculosus* was introduced, it sought shelter amongst its branches, coiling its prehensile tail around the stem,—the colours of the plant and the Pipe-fish harmonizing so exactly, that a search was often necessary to discover it in its hiding-place.

This, however, it would sometimes leave (as though seized with a spirit of adventure), making the tour of the aquarium, paying its respects *en route* to the lobsters in their hiding-places, and darting inquiring glances from its bright and glowing eyes at the *Actinæ* and Star-fishes. It propelled itself rapidly by the undulations of its dorsal and only fin, the rays of which, by the quickness of their motion, became imperceptible to the eye. It occasionally made darts at minute objects, and, I believe, if suitable food could have been supplied, might have been kept alive a considerable time longer. Its forward motion was rectilinear; but when at rest, or in ascending to a higher level, it approached most frequently to the coiled appearance represented by the figure (Plate XII.).

I have compared the specimen with the descriptions and figures of Yarrell's Pipe-fishes, and find that it agrees very closely with Montagu's description of *Syngnathus æquoreus* as quoted by the former author, the chief difference being that our specimen does not exhibit the three slight angles on each side, which Montagu mentions as giving his species "an octangular appearance," the body of our specimen being regularly and most symmetrically ovate. Montagu says also there are thirty-six plates in the tail, ours numbering sixty-six.

But on reference to the descriptive 'Catalogue of Lophobranchiate Fish in the Collection of the British Museum,' by Dr. J.J. Kaup, page 66 (*Nerophis æquoreus*), the difference in the form of the body appears to be sexual, as it is there stated that the female has an octangular body, while the male has a flatter back and belly. It would therefore appear that Montagu has described as specific, characters which pertain to the female only, our example being a male in very fine condition.

The tail in our specimen is perfectly round until within three-fourths of an inch of the end, where it becomes very finely flat-





tened, terminating without any caudal fin whatever, although dead and dried specimens may wrinkle so as to resemble rays at the tip of the tail.

It is difficult to account for the difference in Montagu's statement of thirty-six plates in the tail, Dr. Kaup stating sixty-eight to seventy, and our specimen numbering quite sixty-six. However, in other respects Montagu's description agrees very correctly:—in the number of plates from the gills to the vent (thirty); in the colour and markings,—transverse pale lines and dark margins, one on each joint and one other down the middle of each plate, giving it the appearance of possessing double the number of joints on the body that it really has; the markings also, as in Montagu's species, cease at the tail, or, at all events, become so much fainter as to be almost undistinguishable. The dimensions, proportions of the head, body, and tail, are also the same as Montagu's.

The introduction of a plant of *Halidrys siliquosus* was suggested by our Curator, from the circumstance of a common Pipe-fish (*Syngnathus acus*) having been not unfrequently found lurking amongst the tufts of this species of Alga.

Yarrell's figure conveys so imperfect an idea, that I am induced to give a coloured drawing of our specimen taken from life (Pl. XII.).

XLIII.—On the *Chylaqueous Fluid of the Actiniæ*.

By G. H. LEWES, Esq.

To the Editors of the *Annals of Natural History*.

GENTLEMEN,

Richmond, Nov. 6, 1858.

Absence from England has prevented me from earlier seeing the very interesting communication made by Mr. Gosse in your March Number, p. 172, respecting the so-called "chylaqueous fluid" of the *Actiniæ*.

In my 'Sea-side Studies,' pp. 257 *et seq.*, I recorded the results of numerous observations which showed that in the peritoneal fluid of the *Actiniæ* albumen was *not* a constant, necessary ingredient, because treating it with nitric acid did not produce that milky aspect which would reveal the presence of albumen; and, further, that there were *no* constant morphotic elements, such as could pass for the early form of blood-disks. These observations were confirmed by Mr. Couch, who ingeniously devised the precaution of first emptying the fluid from the *Actiniæ*, and then placing them in *filtered* sea-water. The value of this experiment seems to me considerable, inasmuch as it excludes the chance of albumen, or albuminous corpuscles, in

the water passing thence into the cavity of the Actinia, and assures us that whatever is then found in the Actinia will have been *formed* in it.

Mr. Gosse's observations are directly contradictory of ours. He found the fluid always presenting a milky reaction, except once, and always presenting definite morphotic elements. I regret that he did not also employ Mr. Couch's precaution of filtering the water; it would have given more weight to his objections. Nevertheless, as the matter now stands, a glaring contradiction needs to be reconciled. Mr. Gosse, justly enough, places entire reliance on his results; but he cannot object if I still place reliance on the negatives reached by Mr. Couch and myself, until they are satisfactorily explained. Perhaps some of your readers may feel interested enough in the question to examine it carefully and furnish materials for a decision. I am at present too busily engaged in other researches to repeat the observations with the requisite caution.

The problem to be solved is this:—Can albumen be detected as a *constant* ingredient? Are there any *constant*, definite morphotic elements capable of being received as incipient blood-disks, or chyle-corpuscles?

The mere *presence* of albumen, or of corpuscles, is what *à priori* would be expected: but this proves nothing; for animalculæ are equally present, and various other substances. It is the *constancy* of albumen and corpuscles—and this alone—which can have any physiological import in the present question.

Mr. Gosse very properly criticises an expression of mine respecting the yellow spheres "which make *solid* the tentacles of the *Anthea*,"—an unhappy word, certainly; but it was meant to convey an idea of the greater consistence of the tentacles in *Anthea*, in consequence of which, as I conceive, the tentacles are but slightly retractile. Inasmuch as I had elsewhere described the tentacles as "tubes," it is clear that by calling those of the *Anthea* "solid" I used an inaccurate expression, but could scarcely have meant more than that the spherules lined the tubes.

I remain, Gentlemen,

Yours truly,

G. H. LEWES.

XLIV.—*Descriptions of new Ceylon Coleoptera.*

By JOHN NIETNER, Colombo, Ceylon.

[Continued from page 183.]

AMONGST the 300 species of *Bembidiidæ* which have been described from almost all parts of the world, with the exception

of Australia, it would appear there are also none from Southern Asia. However, since the publication of Lacordaire's '*Genres des Coléopt.*' (1854), in which this statement occurs, various species must have found their way into the Prussian cabinets with my collections from Bengal and this island. In the former country the *Carabidæ* are very abundantly represented; and I recollect with pleasure the great variety of them (from the gigantic *Anthia* down to the smallest *Bembidium*) with which the banks and the sands of the Ganges used to furnish me, when leisurely travelling upon this river some years ago, from August to October, just after the rains. Nowhere have I seen, nor do I expect to see, such swarms of *Cicindelæ*; their buzzing flight, when disturbed, was heard like that of bees. It appeared to me that they did not quit the sands, their favourite haunts, when the tide rose, but allowed themselves to be covered over by the water, as other semi-aquatic beetles do. Without specially hunting for them, I brought away with me some ten species, mostly new, and, amongst the rest of the *Carabidæ*, as many *Bembidia*. In this island, both in the hills and the plains, there is not a bank of a pond, lake, or river which has not, as in more northern latitudes, its *Bembidia*; and, contrary to what one would expect, they appear to be more common in the hot low country than in the cool hill region. The majority of the species described below may any day be found upon the banks of the Colombo Lake. None of the species which, as I said, must have found their way with my collections to Berlin and Stettin, and thence perhaps elsewhere, have, to my knowledge, been described. The descriptions given below must therefore, I am fain to believe, be an interesting addition to the literature of this section of the *Carabidæ*, however inferior they may be to what they might have been had they been produced in Europe, and the insects been collated with allied typical species. I have none of those typical representatives of the genus at hand, nor is my recollection of them sufficiently distinct to permit of my drawing comparisons between them and the Ceylon insects now before me; nevertheless I hope I have set forth the peculiarities of my species with sufficient precision to distinguish them from, or identify them with, any other Cis-Himalayan species that may hereafter be described. As a hopeless confusion appears to exist amongst the subgenera into which the original genus has been broken up, I have not attempted to refer my species to any of them, for fear of thereby doing anything but throwing additional light on the subject. There is no doubt that many more species exist in this island, and that, indeed, as in the case of the Staphylinidæ, they will eventually be found

to be quite as abundantly represented within the tropics as without. Nothing but their smallness has hitherto prevented their discovery.

69. *Bembidium opulentum*, N.

B. oblongum, subconvexum, nebuloso æneum purpureo micans, elytris apice sordide testaceis, subtus nigro-piceum, pedibus antennarumque basi testaceis, ore brunneo. Long. corp. $1\frac{3}{4}$ –2 lin.

Capite inter oculos 2-sulcato, oculis magnis, prominulis, labro fortiter transverso, brevi, integro, mandibulis porrectis, antennis art. 2^o sequentibus parum brevioribus; thorace transversim cordato, antice posticeque truncato, haud emarginato, depresso, margine basique elevato, medio capite parum latiore, apicem versus modice, basin versus fortius abrupteque angustato, angulis basalibus fortiter truncatis profundeque foveolatis, linea longitud. media abbreviata diviso; elytris ovatis, humeris obsoletis, profunde striato-punctatis, punctis apicem versus obsoletis, ante et infra medium utrinque foveolatis, apice lunula magna sordide testacea. (Mas latet).

Prope Negombo, in ripis Maha-Oyæ fluvii, specimina nonnulla cepi.

The insect is of a bronze colour, a purple reflexion appearing on the back in irregular patches as the light may fall upon it. The palpi and the base of the antennæ are of a yellowish colour; the apex of the third joint of the maxillary palpi, however, as well as that of the second, third, and fourth antennal joints, is brown, of which colour is also the remaining part of the antennæ. The second antennal joint is the shortest, the third and fourth are rather longer than the following. The mandibles are rather straight and porrected. The sides of the thorax are almost angular, and furnished with a setigerous puncture at the broadest part; that is, just before the middle. There are seven distinct rows of punctures on either elytron, and an accessory one along the side of the scutellum, the rows decreasing in length towards the margin and the punctures in depth towards the apex, the first row on either side, however, changing before the apex into a furrow which falls in with that which separates the margin from the rest of the elytron. Before and beyond the middle, in the region of the third row of punctures, is an excavation containing a puncture which is situated upon the third interstice. The excavation nearest the base is the deepest. The apex of the elytra is marked with a spot of dirty yellowish colour, prolonged on either side along the margin, which is here rather broad.

If my memory serves me right, the insect resembles the *Tachypus flavipes*.

70. *Bembidium truncatum*, N.

B. oblongum, valde depressum, brunneo-testaceum, oculis nigris, pedibus, antennis palpisque pallide testaceis. Long. corp. $1\frac{1}{2}$ lin.

Capite magno, thorace quarta parte prope minore, inter antennis 2-foveolato, oculis mediocribus, antennis art. 3^o reliquis minore, 4^o–11^o subæqualibus, fortius ovatis; thorace breviter cordato, antice posticeque truncato, haud emarginato, basi subquadrato, parum prolongato, foveis basalibus obsoletis, sed linea basali transversa profunda lineaque longitud. med. distinctis; elytris oblongis, apice *transversim truncatis*, juxta suturam utrinque obsolete 1-striatis, ante et infra med. puncto impressis.

In prov. occid. rarius.

The small size, large head, and truncated elytra effectually distinguish this species. The truncated posterior angles of the thorax, and the general appearance, induce me to consider it as allied to the preceding species—at all events to approach nearer to it than to any of the following species. The eyes are rather small for this genus. There are no traces of striæ on the elytra, with the exception of a single indistinct one along the suture.

71. *Bembidium tropicum*, N.

B. oblongum, depressum, brunneo-testaceum, capite brunneo, elytris dorso nigris cyaneo-micantibus, pedibus, antennis palpisque testaceis. Long. corp. $1\frac{1}{2}$ lin.

Capite inter oculos 2-foveolato-sulcato, oculis mediocribus, antennis fortius filiformibus, art. 3^o reliquis brevioribus; thorace breviter transversim cordato, antice posticeque truncato haud emarginato, basi subquadrato, angulis basalibus elevatis sed haud foveolatis, linea transversa basali profunda, infra lineam strigoso, linea media longitud. diviso; elytris oblongo-ovatis, utrinque juxta suturam 4-striatis, striis externis et his apicem versus obsoletis, in striis punctatis, infra marginem stria profunda abbreviata, ante medium et apicem in interstitio 4^o puncto magno impressis, punctis ante-apicalibus piliferis in sulcum ad apicem prolongatis semicirculum formantibus; tarsis 4 anterioribus art. 4^o subtus apice spinis squamulaceis 2 instructo.

In prov. occid. copiosum.

Of a light brown colour, with the head darker; the elytra blackish on the back with a slight blue reflexion, the base, sides, and apex brownish. The colours being more or less washed into each other, no distinct pattern is observable; the brown spot of the apex, however, is generally pretty clearly set-off from the adjoining dark part. The paraglossæ are hardly longer than the ligula, which itself is rather large. The antennæ are rather hairy and strongly filiform (not, as in most other species, increasing in thickness towards the apex, the joints growing at

the same time more and more oval); joint 3 is the shortest, 2 and 4 are rather longer than the others. The back is impressed with 3-4 distinct striæ on either side of the suture, the external ones being obsolete, as are also the remaining ones towards the apex. There is an additional deep stria within the marginal one, extending from the middle to the apex. Before the middle and before the apex there is a puncture situated upon the 4th interstice; the ante-apical one of these has a hair in the centre, and is prolonged to the apical angle in the shape of a deep, curved furrow. This being the case on either side, the two furrows together form a semicircular figure. The tarsi are each furnished with bristles, especially at the lower margin of the apex of the joints. In the four anterior tarsi joint 4 is furnished at that place with two long bristles, the apex of which fits-in at the base of the claws. These bristles partake somewhat of the nature of squamulæ, by being dilated in the shape of a lancet. I have noticed them occasionally to be bifid at the apex, but I do not think that they are so always.

72. *Bembidium triangulare*, N.

B. oblongum, depressum, testaceum, capite brunneo, elytris sutura fasciæque lata transversali media nigris, pedibus, palpis antennisque pallide testaceis, his medio fusciscentibus. Long. corp. 1 lin.

Præcedenti affine, ejus capite, thorace et tarsis; differt thorace linea basali punctata, infra lineam vix strigoso; elytris utrinque profunde 6-punctato-striatis, striis apicem marginemque versus sensim obsoletis, ante medium in stria 4^a puncto impresso, stria inframarginali abbreviata et impressione semicirculari apicali ut in præcedente.

Variat colore obscuriore.

In prov. occid. communissimum.

Very closely allied to the preceding species, but easily distinguished by the size and colour, which is generally lighter than that of the former, and the deeply striated elytra; the insect is, moreover, more common than the former. The prevailing colour of the elytra is not, as in the preceding species, black, but it is that of the rest of the body, yellowish, with merely a black suture and black belt across the middle; the edges of this belt are washed together with the colour of the adjoining parts. The semicircular impression at the apex of the elytra is the same as in the former, and forms, with the abbreviated inframarginal stria, which is also the same, a triangular figure, tip down, base open, whence I have derived the name. The head, with the antennæ, tarsi, &c., are those of the former, as I have said above.

73. *Bembidium Ceylanicum*, N.

B. oblongum, depressum, testaceum, oculis nigris, elytris sæpissime fascia media transversali fusca obsoletissima, pedibus, palpis antennisque pallide testaceis. Long. corp. $\frac{3}{4}$ lin.

Præcedenti simile, ejus capite, thorace et tarsis, facillime tamen distinguendum antennis apicem versus incrassatis, articulis magis magisque ovatis, art. 2^o sequente longiore, 3^o et 4^o subæqualibus subcylindricis, reliquis ovatis; thorace, linea basali fortiter punctata excepta, basi lævi; elytris utrinque juxta suturam leviter 3-punctato-striatis, striis reliquis et his basi apiceque sensim obsoletis, ante et infra medium ad striam 3^m puncto pilifero impressis, impressione semicirculari apicali ut in præcedente sed stria inframarginali non abbreviata.

In prov. occid. communissimum.

Easily distinguished from the former, to which it is allied, by its size, colour, and the incrassated antennæ. The elytra, moreover, show only three distinct striæ on either side of the suture, two more, however, being just traceable; they are obsolete at the base, apex, and towards the margin. Within the latter there is an additional deep stria, entire, and not, as in the preceding two species, only from the middle to the apex. The semicircular impression of the apex, however, is the same; so are the tarsi, &c.

74. *Bembidium Klugii*, N.

B. ovatum, convexum, æneum, elytris maculis 2 subapicalibus rufo-flavis, subtus piceum, pedibus dilutioribus, tibiis, tarsis antennarumque basi testaceis. Long. corp. $1\frac{1}{2}$ lin.

Capite inter oculos longitud. 2-impresso, oculis maximis, antennis art. 2^o sequentibus parum brevior, his subæqualibus; thorace transversim ovato, antice posticeque truncato, haud emarginato, basi abrupte angustato quadrato, angulis basalibus profunde foveolatis, inter foveas punctis 1-seriatim impresso, linea media longit. subtili diviso; elytris ovatis, apicem versus leviter angustatis, utrinque profunde 7-punctato-striatis, basi lævi, striis apicem versus obsoletis, ante apicem inter strias 3^m–6^m macula orbiculari rufo-flava apiceque impressione semicirculari.

In prov. occid. et centrali, hic usque alt. 3500 ped., non infrequenter legi.

This species ascends from the sea-level of the Western Province to an elevation of 3500 feet on the hills, where I have not unfrequently met with it upon the sandy banks of the Pundhool-Oya, a rocky mountain-stream in the district of Kotmalie. Its robust, ovate, convex shape places it at once in a different division from any of the former. It is of bronze colour, with two orange-coloured spots behind; the mouth is brown, with the

exception of the palpi, which, together with joints 1 and 2 of the antennæ, are yellowish; joint 3 of the maxillary palpi, however, is of the general colour of the mouth. The labrum is square and entire; the 2nd antennal joint is rather shorter than the rest. The thorax is transversely ovate—that is to say, its greatest width is at the middle—not, as in a cordate thorax, before it; the foveæ are connected by a series of punctures, which gradually deepen towards the centre; the longitudinal divisional line is also deeper at the apical extremity than at the other parts. The elytra are impressed with seven deep furrows on either side, deeply punctured at the bottom; these furrows decrease in length towards the margin, and in depth towards the apex, with the exception, however, of the first on either side, which goes straight down to the apex. At the latter comparatively smooth place is the semicircular impression noticed in the three preceding species, and to be noticed in all the following. The base of the elytra is smooth. No traces of punctures, such as are usual in the region of the 3rd or 4th interstice, are observable. The lower side of the insect is of a pitch-colour; the basal part of the legs and thighs are lighter, and the tibiæ and tarsi very light.

75. *Bembidium ebeninum*, N.

B. ovatum, convexum, nigrum, elytris ante apicem maculis 2 rufo-flavis, subtus piceum; pedibus, palpis antennisque testaceis, his apicem versus obscurioribus, reliquis oris partibus brunneis. Long. corp. $1\frac{1}{2}$ lin.

Præcedenti affine, ejus capite et thorace, facillime tamen distinguendum, præter colorem, antennis fortius filiformibus, elytris lævibus juxta suturam utrinque 2-striatis, striis basi abbreviatis, externa apicem versus obsoleta, ante et infra medium leviter foveolatis, ante apicem macula ovata rufo-flava, infra marginem stria profunda apiceque semicirculariter impressis.

In prov. occid. non rarum.

Very closely allied to the preceding species, and equally pretty. Head and thorax entirely those of the former; the antennæ, however, are more filiform, and the divisional line of the thorax is not deepened at the apical extremity. The elytra are smooth, with only two striæ along the suture on either side, the rest not being even traceable; both these striæ are abbreviated at the base, and the outer one becomes obsolete towards the apex; the inner one, however, goes fully down to the apex, and falls in with a deep inframarginal furrow, which is wanting in the preceding species; before and beyond the middle is a small impression; before the apex are two oval spots of orange-colour; the apex has the semicircular impression noticed in the preceding species.

76. *Bembidium orientale*, N.

B. fortiter ovatum, convexum, æneum, elytris maculis 4 magnis flavis, apice sordide subtestaceis, subtus piceum; abdomine brunneo, pedibus, antennarum basi palpisque pallide testaceis. Long. corp. $1\frac{1}{4}$ lin.

Capite inter oculos longitud. 2-impresso, oculis maximis, antennis art. 3^o et 4^o subæqualibus, 2^o his vix brevior; thorace transverso, leviter ovato, antice posticeque truncato, haud emarginato, leviter angustato, basi quadrato, 2-foveolato, inter foveas punctis 1-seriatim impressis, linea longit. media diviso; elytris ovatis, apicem versus fortius angustatis, utrinque profunde 7-striatis, basi lævi, striis marginem apicemque versus magis magisque obsoletis, in stria 3^a ante et infra medium puncto impressis, infra humeros inter striam 5^m et marginem macula ovata, ante apicem inter striam 2^m et marginem macula obliqua flava, apice sordide obsoleteque testaceis, hic semicirculariter et infra marginem stria profunda impressis.

In prov. occid. commune.

Easily distinguished by its strongly oval shape, the thorax being hardly contracted at the base, and no doubt belonging to a different subgenus from the preceding and the following. The head is exactly that of *B. Klugii*. The antennæ have the 2nd joint hardly shorter than the 3rd, and this and the following subequal; joints 1-4 are of a light yellowish, the rest of a brown colour; joint 3 of the maxillary palpi is of a dark, the remaining ones and the labial palpi of a pale yellowish colour. The labrum is square, entire, and, with the rest of the mouth, brown. The mandibles are furnished with 3-4 small teeth below the middle. The ligula is broader than in any of the other species. The thorax, besides in shape, is distinguished by having the foveæ removed from the basal angles towards the centre. The elytra are impressed with seven distinct striæ on either side, the first of which runs down to the apex, where it falls in with the inframarginal one; the rest decrease in length towards the margin, and in depth towards the apex; beyond the 7th another is just traceable, and beyond this there is a deep inframarginal one. The apex is impressed with the semicircular figure which distinguishes all the species here enumerated, with the exception of *B. opulentum* and *truncatum*. The colour of the insect is a dark, bright metallic green, variegated with four large yellow spots on the elytra; two of these are near the shoulder and of oval shape, the other two near the apex and oblique; the apex is of a dirty yellowish colour. The lower part of the insect is of a pitch-colour, lighter towards the apex; the legs are yellowish, darker towards the base.

77. *Bembidium emarginatum*, N.

B. ovatum, convexum, piceum, capite dilutiore, elytris ante apicem

maculis 2 rufo-flavis, subtus brunneum; pedibus, antennarum basi palpisque testaceis. Long. corp. 1 lin.

Capite antice fortius acuminato, fronte utrinque profunde pluries sulcata, oculis mediocribus prominulis, *labro profunde subangulate emarginato*, antennis art. longitudine subæqualibus; thorace breviter cordato, antice posticeque truncato, non emarginato, basi quadrato, foveis basalibus lineaque longit. media fere obsoletis, linea basali transversa tamen distincta; elytris ovatis, juxta suturam utrinque 2-striatis, stria externa basi apiceque abbreviata, ante et infra medium puncto obsoleto impressis, ante apicem macula orbiculari rufo-flava apiceque sordide obsoleteque testaceis, hic semilunariter et infra marginem stria profunda impressis.

Variat colore dilutiore.

In prov. occid. rarum.

This and the two remaining species are mutually allied, and probably belong to the subgenus *Lopha*. However, I am less sure of this with regard to the present species than to the two following.

The head is pointed in front, and the labrum (an unusual occurrence) deeply notched; two deep furrows run from the clypeus straight across the forehead to the vertex; and from their base other smaller ones radiate towards the eyes. Joints 2-5 of the antennæ, which in almost all cases are of unequal length, are not so in the present; the first two or three joints are yellowish, the rest are brown. Joint 3 of the maxillary palpi is dark, the remaining ones and the labial palpi yellowish. The elytra are impressed with two striæ on either side of the suture; the remaining ones are just traceable. The one next to the suture goes straight down to the apex, where it falls in with a deep inframarginal furrow; the 2nd is, as usual, abbreviated. The apex is impressed with the semicircular figure; and there are two punctures on either side.

78. *Bembidium ornatum*, N.

B. ovatum, subconvexum, brunneum, elytris maculis 4 flavis, pedibus, antennis palpisque pallide testaceis. Long. corp. 1 lin.

Præcedenti simile, præter colorem facillime tamen distinguendum corpore graciliore, fronte utrinque 2-sulcata, labro integro, elytris infra humeros et infra marginem utrinque macula orbiculari flava, punctis nullis.

Variat colore obscuriore et dilutiore et sæpius apice sordide testaceo.

In prov. occid. commune.

Easily distinguished from the preceding species, with which it agrees in all other respects; no striæ, however, are traceable

upon the elytra between the two near the suture and the infra-marginal furrow.

79. *Bembidium scydmænoides*, N.

B. ovatum, convexum, obscure brunneum, elytris maculis 4 magis minusve obsoletis dilutioribus, pedibus, palpis antennarumque art. 2. primis testaceis, his apice reliquisque obscurioribus. Long. corp. 1 lin.

Præcedenti simile, corpore robustiore, fortius ovato magisque convexo, thorace basi fortius quadrato facillime distinguendum.

In prov. occid. comunissimum.

Tribe HARPALIDÆ.

Megaristerus, n. g., N.

Corpus oblongum, depressum, glabrum. Caput mediocre antice, obtusum. Mentum profunde subquadrate emarginatum, edentatum, lobis extus rotundatis, apice acuminatis. Ligula minima, oblonga, paraglossis magnis connatis eam totam amplectentibus, antice rotundatis, subcordate emarginatis. Palpi maxill. art. ultimo subcylindrico, apice magis minusve angustato, truncato, lab. eodem obovato, truncato. Labrum transversum, antice posticeque angustatum, margine anteriore profundius emarginato, setoso. Clypeus emarginatus. Mandibulæ validæ, trigonæ, apice leviter arcuatæ, dextera mediocri labro oblecta apice acuminata medio 1-dentata, sinistra robustiore porrecta (hinc n. g. *Megaristerus*) apice obtusa medio 2-dentata. Antennæ humeros parum superantes, filiformes, art. 2^o sequente parum brevior, reliquis subæqualibus. Thorax rotundato-cordatus, postice angustatus angulis rotundatis, antice leviter emarginatus angulis distinctis. Elytra parallela, apice rotundata. Pedes ut in g. *Acupalpo*, tarsis maris 4 ant. tamen art. 1^o subtus nudo.

Victus Harpalorum.

Apparently closely allied to *Amblystomus*,—differing, however, in the sculpture of the tarsi, and in the antennæ, labrum, and palpi; and, as in the diagnosis as given by Lacordaire in his 'Gen. des Col.,' the paraglossæ of *Amblystomus* are simply said to be rounded in front, a further distinction would appear to reside in the notch which exists in that part of the paraglossæ of my genus *Megaristerus*. Also allied to *Acupalpus*, the sculpture of the tarsi being exactly the same,—in saying which, I bear particularly in mind that the intermediate ones of the male are hardly dilated. From this genus, however, it is effectually distinguished by the shape of the ligula. From both *Amblystomus* and *Acupalpus* the present genus, moreover, differs in the vesture of the four anterior tarsi of the male, the first joint being naked below—and in the mandibles, the left one of which is much larger

and plumper than the right one, protruding from under the labrum, whilst the latter is hidden by it; the former is at the same time obtuse at the apex, whilst the latter is pointed. In the *M. Indicus* this peculiar construction is hardly striking, but in the other two species it is *very much so*, and imparts a curious appearance to the head of the insect.

80. *Megaristerus mandibularis*, N.

M. piceo-niger, leviter metallescens, subtus brunneus, antennis, tibiis tarsisque testaceis, ore brunneo. Long. corp. $1\frac{1}{2}$ –2 lin.

Capite inter antennis 2-foveolato, mandibula sinistra robustissima porrecta, dextera mediocri labro oblecta; thorace basi 2-foveolato, linea longitud. utrinque abbreviata media diviso, antice lunate impresso; scutello majore; elytris obsolete striatis, striis juxta suturam distinctioribus, cum thorace parce subtiliterque punctulatis, inter med. et apic. ad striam 2^m puncto impresso.

Prope Colombo rarus.

81. *Megaristerus stenolophoides*, N.

M. brunneo-piceus, elytris obscurioribus metallescentibus maculis 4 flavis, margine suturæque apice brunneis, pedibus, antennarum basi palporumque apice pallide testaceis, ore, mandibulis brunneis exceptis, testaceo. Long. corp. $1\frac{1}{2}$ lin.

Præcedenti similis, corpore robustiore minus depresso et colore facile tamen distinguendus. Differt præterea palpis max. art. 4^o minus distincte, lab. eodem fortius truncato; thorace magis transverso, basi obsolete ruguloso; elytris profundius striatis, puncto ad striam 2^m fere obsolete, cum thorace haud punctulatis, maculis 4 subobliquis flavis; 2 humeralibus in interstitiis 5^o–6^o, 2 subapicalibus in interstitiis 3^o–4^o.

Prope Colombo rarus.

82. *Megaristerus Indicus*, N.

M. obscure viridi-æneus, elytris maculis 2 humeralibus obliquis pustulisque 2 subapicalibus flavis, subtus brunneus, tibiis tarsisque testaceis, antennarum basi oreque brunneo-testaceis. Long. corp. $1\frac{1}{2}$ lin.

Differt a *M. mandibulari* mandibula sinistra altera vix robustiore, elytris infra humeros inter marginem et striam 2^m macula obliqua intus angustata ante apicem in interstitio 3^o pustula parva flavis, apice fortius quam in præcedente rotundatis.

Prope Colombo mihi, Maderaspatani a Dom. Hon. W. Elliot specimen nonnulla nocte ad lumen capta.

Tribe POGONIDÆ.

Spathinus, n. g., N.

Corpus obovatum, subconvexum, glabrum. Caput mediocre, antice

trigonum, oculis magnis, semiglobosis, prominulis, collo brevi. Mentum transversum, profunde quadrate emarginatum, dente sat forti acuto, lobis intus inter med. et apicem leviter oblique truncatis, extus rotundatis, apice acuminatis. Ligula minuta, elongata, paraglossis latis connatis eam haud multo superantibus, apice intus oblique truncatis subacuminatis. Palpi art. ultimo conico acuminato, max. art. 3^o invertito, ultimo æquali, lab. eodem robustiore. Labrum quadratum, antice profunde emarginatum, angulis ant. rotundatis. Mandibulæ porrectæ, trigonæ, apice acuminatæ, basi dentatæ. Antennæ sat robustæ humeros parum superantes, art. 2^o-3^o subæqualibus, subcylindricis sequentibus brevioribus, his subæqualibus, obovatis. Thorax transverse subquadratus, antice lateribus leviter rotundatus, postice parum angustatus, basi leviter rotundatus, angulis subrectis. Elytra ovata, apice rotundata. Pedes anteriores tibiis profunde emarginatis, tarsis maris art. 1^o-3^o leviter dilatatis, subtus squamulis munitis, art. 1^o subcylindrico, 2^o-3^o subrotundatis, 4^o subtrigono, unguiculis simplicibus.

Victus Bembidiorum.

Apparently closely allied to *Trechus*, and an aberrant form of the same tribe to which the latter genus belongs. The mentum and palpi appear to agree entirely; the insects differ, however, in the structure of the ligula (which, in *Spathinus*, is entirely that of a *Bembidium*) and the sculpture and vesture of the anterior male tarsi. In spite of the latter anomalies, the preeminently characteristic shape of the palpi convinces me that the insect must find a place where I have put it. It is also closely allied to my genus *Ochtheophilus*, differing from it, however, in the ligula, palpi and labrum. The generic name *Spathinus* signifies a staggard, and I have chosen it with regard to the shape of the terminal joint of the palpi. The insects are common throughout the south-west and west of the island, where they live in the manner of the *Bembidia*, under decaying vegetable matter, upon the banks of lakes and rivers, &c.

83. *Spathinus nigriceps*, N.

S. alatus, tenuiter hirsutus, brunneo-testaceus, capite nigro, elytris apice fuscis, ore, antennis pedibusque testaceis. Long. corp. 1½ lin.

Capite inter antennis profundius 2-foveolato, fronte medio leviter depressa; thorace levi, linea longit. media diviso; elytris juxta suturam obsolete striatis.

84. *Euplynes Dohrnii*, N.

E. ovatus, subconvexus, rufo-testaceus, oculis nigris, elytris viridibus, femoribus apice tarsisque geniculis fuscescentibus. Long. corp. vix 4½ lin.

Capite inter antennis bifoveolato; antennis art. 2^o brevī, reliquis

subæqualibus; palpis art. ultimo subelliptico truncato, labialibus elongatis; thorace breviter transversim cordato, antice posticeque truncato, longitudine sesqui latiore, depresso, lateribus basique elevato, hic leviter bifoveolato, angulis basalibus subrectis leviter rotundatis, linea med. longitud. diviso, subtiliter transversim ruguloso; elytris ovatis, leviter dilatatis, thorace duplo fere latoribus, striatis, in regione basali in stria 3^a, ad et infra medium in stria 2^a puncto impressis, in regione media utrinque depressis, ante apicem leviter angustatis et sinuatis, apice levissime transversim truncatis, angulo interno in spinam producto; pedibus tibiis fortiter tarsisque 4 posticis dorso modice costatis.

In campis silvisque prov. occid. et in montibus prov. central. usque alt. 4000 ped. sub vegetab. per occasionem copiose legi.

This insect frequents localities of a very different nature: I have taken it in great abundance in the Negombo district, in hot, sandy fields, under heaps of weeds, &c.; but I have also taken it on the banks of the Colombo Lake, and in the damp forests of Pusilawa, 4000 feet above the sea, under fallen trees; its favourite haunt, however, appears to be the former description of locality. It would appear to be very distinct from the *E. cyanipennis*, described by Schmidt-Göebel in his 'Col. Birm.,' in thorax, sculpture of apical part, and position of punctures of elytra, costated 4 posterior tarsi, &c. On the other hand, the curious depression of the elytra, which has much the appearance of being accidental, is the same (it occurs also in my genus *Anchista*). I am not quite satisfied with the description of the ligula and tarsi as given by Schmidt-Göebel. The former I should call "truncated at the apex, anterior angles strongly rounded-off." In the insect before me it is certainly not rounded in the middle; if anything, it is rather the contrary. The tarsi I should describe thus:—"Joints 1-4 of the two anterior male tarsi dilated; joint 1 nearly as long as the two following together, subcylindric; joint 2 nearly as long again as the following, elongate-trigonal; joint 3 subtrigonal; joint 4 (in all tarsi) bilobed; joints 1-3 furnished below with two series of lamellated papillæ fenced in by bristles; joint 4 densely penicillated; claws simple."

I take this opportunity to add a general remark. The author above quoted, at the end of the description of his *E. cyanipennis*, quotes a passage from Helfer's 'Burmese Journal,' implying "that the species lived exclusively upon trees, and that most of the Carabidæ of that country had the same habit." The latter part of this observation I feel inclined to look upon as a rash and unjustifiable assertion on the part of Helfer. There can be little doubt (and the above is an additional example) that the Carabidæ of this island have much resemblance to those of Burmah; still

my long experience in it has not furnished me with any instances of any of them living *upon* trees, with the exception of the *Tricondyla*, *Collyrides*, and certain *Cicindela*. The *Casnonia* and *Ophiopnea* are in the habit of ascending grasses and low herbs, and certain *Lebiidae* and the genus *Catascopus* live under the bark of trees : this is all. As to the insect described above, although it appears to adapt itself with facility to a variety of physical circumstances, and although it takes occasionally to its wings and flies into houses in the evening, I have never found it *upon* trees.

XLV.—On another new species of *Lardizabala*.

By JOHN MIERS, F.R.S., F.L.S. &c.

[Continued from p. 192.]

I HAVE lately observed, in the herbarium of the Paris Museum, another undescribed species of this genus, the description of which I here append to the former :—

3. *Lardizabala infuscata*, n. sp.; — volubilis, foliis biternatis, foliolis ellipticis apice vix acutis vel obtusiusculis, puncto calloso onustis, terminalibus in petiolulum longiusculum cuneatis, lateralibus sessilibus basi inæqualibus et obtusioribus, glaberrimis, crasso-coriaceis, supra intense fusco-viridibus, nitentibus, simpliciter nervosis, nervis patentibus immersis, subtus pallidioribus brunneis, lucidis, costa nervis venisque prominentibus, marginibus revolutis integris vel obsolete crenulatis; stipulis orbicularibus majusculis, fuscis; racemis ♂ axillaribus folio sub-brevioribus.—Chile Australis: v. s. in herb. Mus. Paris (Hombron, Voyage de l'Astrolabe et Zélée).

This species is at once recognized from *L. biternata* by the extremely dark colour of its leaves and by their much greater thickness and opacity, thus offering a strong contrast to the light green colour of the typical species. In the latter the leaflets are 3-nerved from near the base, but in this plant no such lateral nerves are present; in the typical species a portion of the early pubescence is always found remaining upon the nervures and petioles, but here they are quite free from hairs; the petioles of the intermediate leaves are also much longer in this species. The internodes between the axils are $2\frac{1}{2}$ in. long; the leaves altogether are $3\frac{1}{2}$ in. long; the main petiole is 5 lines long; the two lateral secondary petioles are 5 lines, the intermediate one 12 lines long; the lateral leaflets are 17–21 lines long, 9–11 lines broad; the intermediate leaflets are $2\frac{1}{2}$ in. long, including their petiole of 3 lines, and 10–14 lines broad; the orbicular stipules are 6–8 lines in diameter; the raceme is $2\frac{1}{2}$ inches long, with about fifteen alternate male flowers.

XLVI.—On Permian Entomostraca from the Fossiliferous Limestone of Durham. By J. W. KIRKBY.

[With a Plate.]

[Concluded from page 330.]

Bairdia Jonesiana, n. sp. Plate XI. figs. 1, 2, & 2 a.

- SYN. *B. gracilis*, M'Coy, Jones, Mon. Perm. Foss. p. 63. tab. 18. fig. 7.
B. gracilis, M'Coy, Reuss, Jahres. Wetterau. Gesell. 1851–1853, p. 65.
B. gracilis, M'Coy, Richter, Zeitschr. Deutsch. Geol. Gesells. 1855,
 vol. vii. p. 530. tab. 26. figs. 16 & 17.

Length $\frac{1}{2\frac{1}{3}}$ inch; height $\frac{1}{3\frac{1}{3}}$ inch.

Carapace reniform, convex, smooth. *Dorsal margin* regularly arched; *anterior slope* gradual, convex, descending one-half of the height; *posterior slope* more abrupt, convex, descending five-sixths of the height. *Ventral margin* sinuate centrally, convex near the extremities. *Anterior extremity* bluntly rounded. *Posterior extremity* obtusely pointed. *Lateral contour* compressed oval, the posterior end the most acute; *greatest diameter* central, one-third of the length. *Flange* of left ventral margin large, being fully one-third of the length.

The chief variation of form shown by this species is in the dorsal margin, which is more prominent in some specimens than in the generality. Fig. 2. Pl. XI. illustrates this variety. In no instance have I met with examples so attenuate as the one from Byers' Quarry, figured by Jones.

It resembles in many respects the *Cythere Geinitziana** of Jones, which appears to be a closely related form. The dorsal margin of the latter, however, is more flatly convex, its posterior extremity is more acutely pointed, and it is medianly placed, and the sinus of its ventral margin is deeper than the same feature in *B. Jonesiana*; its lateral contour is peculiar also, being ovate, while that of the other is a flattened oval, with rather acute extremities. In these particulars it differs from the present species; and I allow them specific value.

There can be little doubt as to the identity of this species with Mr. Jones's specimen from Byers' Quarry, which he identified with the *Bairdia gracilis*† of M'Coy. A single cast, much worn, was the only material which Mr. Jones possessed; so that some difference might be expected between his figure and more finely preserved specimens of the same species, even had it really belonged to *B. gracilis*,—an idea, however, which is not maintainable when the Professor's description and figures are compared with perfect specimens of the Permian species. The de-

* Prof. King's Mon. Perm. Fossils, p. 62. tab. 18. fig. 4 a, b, c.

† Prof. M'Coy's Syn. Char. Carbon. Foss. Ireland, p. 165. pl. 23. fig. 7.

scription given by M'Coy is very short, and his figures represent only a portion of a carapace: the former would apply to many species besides the one to which it refers, so that it is not of much use in the determination of apparent affinities; but his figures show that the Carboniferous species had at least one prominent rostrated extremity, and that it was compressed and concave laterally towards the extremities,—characters which certainly distinguish it specifically from its supposed Permian representative.

Most of the specimens of this species which have occurred at Tunstall Hill are coated with a thin deposit of calcareous matter; and it is not until this is removed that their relation to *Bairdia* can be detected.

It is not rare in the fossiliferous limestone of Tunstall Hill. In Germany it is found in the Lower Zechstein of Bleichenbach, Selters, and Saalfeld.

B. Jonesiana is named after Mr. T. Rupert Jones, to whom I am indebted for several courteous communications on Permian Entomostraca.

Bairdia truncata, n. sp. Pl. XI. figs. 4 & 4 a.

Length $\frac{1}{3}$ inch; height $\frac{1}{60}$ inch.

Carapace subrhomboidal, inflated ventrally in anterior half, smooth (?). *Dorsal margin* almost straight, though slightly convex; *anterior slope* gradual, convex; *posterior slope* very abrupt, descending nearly the whole of the height, convex. *Ventral margin* rather convex, with a short projection near the anterior extremity. *Anterior extremity* rounded, prominent. *Posterior extremity* diagonally truncate. *Lateral contour* irregularly lenticular; *greatest diameter* in anterior half two-sevenths of the length, pointed anteriorly, bluntly rounded posteriorly, sinuate in posterior half.

The few specimens of this species which I have found are casts; consequently the above description is probably incomplete and subject to modification. That it belongs to *Bairdia* is evident by traces of an overlapping of the dorsal margin. Its marked difference from all the Permian species which have preceded it has induced me to describe it as a species, though from imperfect materials.

Rare in the fossiliferous limestone of Tunstall Hill.

Bairdia rhomboidea, n. sp. Pl. XI. figs. 3 & 3 a.

Length $\frac{1}{3}$ inch; height $\frac{1}{50}$ inch.

Carapace subrhomboidal, protuberant centrally, smooth. *Dorsal margin* prominently convex, sloping gradually to each extremity. *Ventral margin* very convex, more so anteriorly than

posteriorly. *Anterior extremity* subangulate. *Posterior extremity* somewhat produced, bluntly pointed. *Lateral contour* lenticular; *greatest diameter* central, rather more than one-fourth of the length. *Hinge* with the left valve overlapping the right evenly along the dorsal margin. *Flange* of left ventral margin posteriorly situate.

Very rare in the fossiliferous limestone of Tunstall Hill.

Besides the species of *Bairdia* already noticed, there appear to be one or two additional forms belonging to the fauna of the fossiliferous limestone, which may subsequently be established as species. Specimens have occurred that seem to imply this idea; but, owing to a paucity of materials, and, in some cases, to an apparent affinity to described species, I have not ventured to specialize them. There was one well-marked individual, of triangular contour, which was unfortunately lost after it had been outlined, and which I have little doubt was the *Cythere acuta* of Jones. It was minute and exceedingly globose; the ventral margin almost straight, and the dorsal margin convex; the extremities acute and similar.

Leperditia? *Permiana*, Jones. Plate XI. figs. 5-13.

SYN. *Dithyrocaris Permiana*, Jones, Mon. Perm. Foss. p. 66. tab. 18. fig. 1.
Ceratiocaris? *Permiana*, Jones, Morris's Cat. Brit. Foss. 2nd edition, 1854, p. 103.

Length $\frac{1}{20}$ inch; height $\frac{1}{45}$ inch.

Carapace oblong-ovate, ark-shaped, equivalve, very convex; valves thick. *Dorsal margin* straight, bounded laterally by flatish, slightly inclined areas formed by the depression of the upper region of the valves. *Ventral margin* straight centrally, or very slightly sinuate. *Anterior extremity* angulate at its junction with the dorsal margin, and bluntly rounded ventrally: the dorsal angle is sometimes the most prominent; at others a point midway between the margins protrudes most. *Posterior extremity* angulate dorsally, more pointed than the former, the antero-dorsal angle being more projecting, from which a convex line slopes gradually to the ventral margin. From the extreme points of the dorsal margin of each valve proceed two strongly produced rims, or marginal expansions, which become more widely separate as they approach the ventral margin. The *innermost rim* (of single valve) is elevated, and forms a raised reflexed edge round the middle portion of the valve. The *outermost or most ventral rim* is not reflexed, but projects at a right angle from the ventral portion of the valve; along the inner surface of this rim, which forms the contact-margin of the valve, extends a slightly elevated projection, on a plane with the ventral convexity of the

valve, and which appears to overlap (?) a similar longitudinal projection in the opposite valve. The outer surface of the valve within the innermost rim is deeply channeled. The *central area* of the valves is protuberant, rising abruptly from the channeled depression just mentioned; dorsally and towards the posterior extremity this area is very prominent, or slightly gibbose. Surface ornamented with irregularly-placed roundish pits, and with slender longitudinal wrinkles which occasionally bifurcate and merge into each other. *Hinge* with the dorsal margins united by ligament (?). *Lateral contour* ovate, with strongly produced extremities.

This remarkable species does not vary much in marginal outline. The posterior extremity is occasionally rather less pointed than usual, and the anterior extremity differs a little in convexity; the ventral margin also has at times a tendency to become sinuate. The variation of the posterior extremity is of most importance, as in some cases the slight modification which it undergoes causes it to assume the form of the anterior.

One of the most peculiar characters of this species is the curious marginal rims which bound its free margins and form so important a feature in its ventral aspect. I have never observed more than two rims on each valve, except in one instance, which was a perfect specimen, having three rims on the right valve, with only two on the left. These rims very much remind one of exfoliative dilatations of the margins, such as are seen in some species of Conchifera and Brachiopoda: but when the Entomostracan mode of growth is considered, the idea is found to be untenable; for we must suppose that these species, like their recent representatives, would increase in size by moulting, and not by marginal increment. The youngest specimens possess the same rims in miniature; indeed, all stages of growth are characterized by them, though the older individuals have them most produced. One very fine specimen (fig. 11) shows several fine lines between the outer and inner rims, and running parallel with them. I have not been able to prove satisfactorily that the longitudinal projection on the internal surface of the most ventral rim (see fig. 13) of one valve overlaps that of the opposite, though, from the close union of the extreme edges of these rims in some specimens, it may be inferred that it does. The free margins fit close; consequently the whole of the animal must have been enveloped by the valves.

The central area of the valves is generally very much produced, but more so in some specimens than in others. Sometimes its connexion with the marginal portion of the valves is so abrupt as to cause it to appear like a great tubercle; at others it slopes more gradually towards the margin, and wears a less gibbose

aspect: this is particularly the case in young specimens. The postero-dorsal region of this area is always the most prominent portion of the valve; and as the central portion of the dorsal region is at times rather depressed, both it and the antero-dorsal angle have then a gibbose appearance. Such specimens assimilate to the *L. (Cythere) Schrenkii** of Keyserling, whose equivalent regions are extremely gibbose. As the central area varies in prominence in different specimens, so do specimens vary in width, and that very considerably.

Although there can be little doubt of this species being characterized by a punctured surface, yet it is a character that has only been observed in two specimens, both of which are represented in Pl. XI. Usually the surface is either smooth, like that of fig. 5, or wrinkled, like that of fig. 8, and shows no traces of punctures, even when viewed with the aid of a high magnifying power. Perhaps this may result from a peculiarity of fossilization, though, from the number of specimens which have been examined, it is more likely that some individuals of the species were punctured and others were not. The punctures which have been detected are minute, and require a lens of moderately high power to resolve them. They are observed best on the central and dorsal areas; indeed I have not noticed them elsewhere. The longitudinal wrinkles are also confined to the same regions, but chiefly to the central area. They are tenuous, and trend somewhat irregularly in a direction parallel with the free margins.

L.? Permiana seems to be nearly related to the Russian species, *L.? stricta*, Keyserling†. The latter species has rounder extremities, its ventral margin more deeply sinuate, and is apparently more compressed than the former. Some difference also exists in the punctured ornamentation, which in *L. stricta* is very regularly arranged. Both agree, however, in possessing two expanded rims on the free margin of each valve. *L.? Roessleri*, Reuss‡, of the Lower Zechstein also corresponds in this respect, and will probably prove to be closely related.

It is not uncommon in the fossiliferous limestone of Tunstall Hill, and in the Upper Permians of Byers' Quarry.

The generic affinities of this species and of its congeners are involved in some obscurity. When first described by Mr. Jones, from specimens on the limestone slabs of Byers' Quarry, it was referred by him to the genus *Dithyrocaris* of Dr. Scouler. In placing it there, he admitted that it was questionable whether it in reality belonged to that group or not; for his own specimens

* Reise durch die Tundren der Samojeden, p. 112. taf. 4. fig. 37.

† Loc. cit. p. 112. taf. 4. fig. 38.

‡ Jahres. Wetterau. Gesell. 1851-1853, p. 70.

were not well preserved, nor had the characters of the genus been properly defined by its author: but from the data offered by the imperfect materials in his hands, he thought it possible that it might have some affinity to it; so he placed it in it provisionally.

Dithyrocaris was originally considered by Dr. Scouler to have a univalve carapace, like *Apus* and other single-valved Branchiopoda*. He afterwards altered his views, supposing it to be bivalve, like *Cypris*, though differing from that genus in having caudal appendages protruding from the valves. This opinion was held until 1843, when Colonel Portlock described two new species from the shales of the Lower Carboniferous rocks of Ireland†, and proved that its carapace was univalve, as Dr. Scouler had supposed at first. Colonel Portlock's description of these species, particularly of *D. Colei*, can leave no doubt of the correctness of his views in this respect, and clearly demonstrates that *Dithyrocaris* is a univalve Entomostracan—that is, supposing Dr. Scouler's species belong to the same group, which may be taken for granted until proved to the contrary.

All the examples of *L.? Permiana* which came under the notice of Mr. Jones were, as stated before, more or less imperfect; so it may naturally be supposed that great difficulty would occur in attempting to determine the generic affinities of the species to which they belonged. It is evidently owing to this cause that Mr. Jones supposed that it might be a member of *Dithyrocaris*. It is from the perfect state of preservation of my specimens that I have been enabled to offer the preceding remarks in addition to those of Mr. Jones. And as some of the specimens have the valves united and in close juxtaposition, I have also been enabled to prove that the species was a bivalve Entomostracan, like *Cythere*, or rather *Leperditia*, consequently that it has no affinity to *Dithyrocaris*—nor to *Ceratiocaris*, to which Mr. Jones afterwards referred it‡, its bivalvular character also, of course, excluding it from that genus.

German and Russian palæontologists have referred congeneric species to *Cythere*; but, with the exception of being bivalve, they possess no characters to warrant their remaining there.

The true generic affinities of *L.? Permiana* and its congeners I leave to be determined by my friend Mr. Jones, as he tells me that he has long been investigating their relations, and as I am quite sure that he is more competent to do so than I am. I am of opinion that they will be found to constitute a new group.

* Records of Science, Feb. 1835; and in a paper read before the British Association at Glasgow. See also Jones on *Dithyrocaris*, in Prof. King's Mon. Perm. Foss. p. 64.

† Report of the Geology of the County of Londonderry, pp. 313–316. pl. 12.

‡ Morris's Cat. British Fossils, 2nd edit. p. 103.

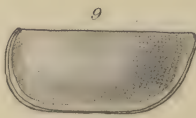
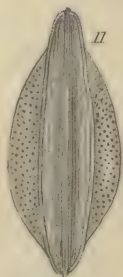
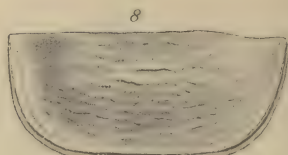
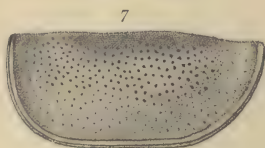
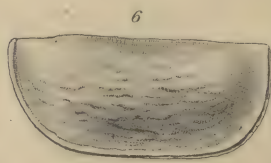
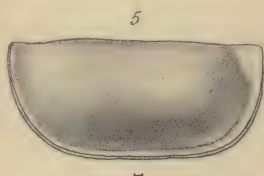
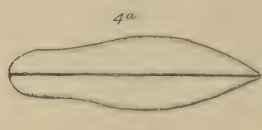
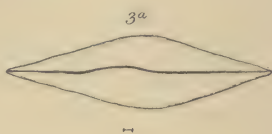
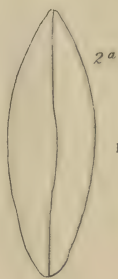
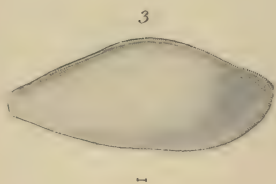
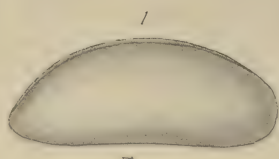
The present species is merely placed in *Leperditia* as an approximation to its true position, and not because I think it ought to remain there, though probably this genus and *Beyrichia* will prove very close neighbours to it.

Besides the species under notice, Mr. Jones has described another from Byers' Quarry—*L. ? glypta*. In Germany, another has been described by Dr. Reuss under the name of *Cythere Roessleri*; and Count Keyserling has noticed three more from the Permians of Russia, terming them *Cythere Schrenkii*, *C. stricta*, and *C. grapta*.

The following Table gives a general view of the Permian Entomostraca, with their distribution in England, Germany, and Russia :—

		Eng-land.		Germany.	Russia.	Remarks.
		Foss. lime.	Upper lime.	Lower Zechstein.	Stratigraphical group unknown.	
1	<i>Cythere ? Morrisiana, Jones</i>	..	*	..	..	Probably belonging to <i>Bairdia</i> .
2	— <i>elongata, Jones</i> .....	..	*			Probably belonging to <i>Bairdia</i> .
3	— ? <i>Geinitziana, Jones</i> ..	..	*	*	..	A form resembling this species occurred to me in the Permians of South Yorkshire.
4	— ? <i>Kutorgiana, Jones</i> ..	..	*	..	..	Probably belonging to <i>Bairdia</i> .
5	— <i>bituberculata, Reuss</i> ..	..	..	*
6	<i>Cythereis bicipitata, Jones</i> ..	..	*		
7	— <i>drupacea, Richter</i> ....	..	..	*
8	<i>Cytherella inornata, M'Coy</i> ..	..	*	*	..	{ A somewhat similar form occurred to Prof. King in Tullyconnel limestone, Ireland.
9	— <i>nuciformis, Jones</i> ....	..	*	*	
10	<i>Bairdia acuta, Jones</i>	*?	*			
11	— <i>plebeia, Reuss</i>	*	*	*		
12	— <i>Kingii, Reuss</i>	*	..	*		
13	— <i>mucronata, Reuss</i>	*	..	*		
14	— <i>ampla, Reuss</i> .....	..	..	*
15	— <i>frumentum, Reuss</i> ..	..	..	*
16	— <i>ventricosa, Kirkby</i> ..	*				
17	— <i>Reussiana, Kirkby</i>	*				
18	— <i>reniformis, Kirkby</i>	*				
19	— <i>Schaurothiana, Kirkby</i> ..	*				
20	— ? <i>Berniciensis, Kirkby</i> ..	*				
21	— <i>Jonesiana, Kirkby</i>	*	*	*	..	{ Prof. King found a specimen resembling this species in the Tullyconnel limestone.
22	— <i>rhomboidea, Kirkby</i> ..	*				
23	— <i>truncata, Kirkby</i>	*				
24	<i>Leperditia ? Permiana, Jones</i>	*	*			
25	— ? <i>glypta, Jones</i> .....	..	*		
26	— ? <i>Roessleri, Reuss</i> .....	..	..	*
27	— ? <i>stricta, Keyserling</i> ..	..	..	..	*
28	— ? <i>Schrenkii, Keyserling</i> ..	..	..	..	*
29	— ? <i>grapta, Keyserling</i> ..	..	..	..	*
30	— ? <i>recta, Keyserling</i> ....	..	..	..	*	{ As this species seems to have some affinity to the six preceding, it is placed in the same genus.
31	<i>Cythere Pyrrhæ, Keyserling</i>	..	..	..	*
32	— <i>Cyclas, Keyserling</i> ....	..	..	..	*





EXPLANATION OF PLATE XI.

- Fig. 1. *Bairdia Jonesiana*, n. sp. : right valve ; magnified 30 times.
 Fig. 2. *Bairdia Jonesiana*, a less elongate form : right valve ; magnified 30 times.
 Fig. 2 a. *Bairdia Jonesiana* : lateral contour.
 Fig. 3. *Bairdia rhomboidea*, n. sp. : right valve ; magnified 26 times.
 Fig. 3 a. *Bairdia rhomboidea*, lateral contour.
 Fig. 4. *Bairdia truncata*, n. sp. : east of right valve ; magnified 38 times.
 Fig. 4 a. *Bairdia truncata*, lateral contour.
 Fig. 5. *Leperditia? Permiana*, Jones : right valve, having a smooth surface ; magnified 26 times.
 Figs. 6 & 8. *Leperditia? Permiana* : right and left valves, showing a wrinkled surface ; magnified 26 times.
 Fig. 7. *Leperditia? Permiana* : left valve of a specimen with a punctured surface ; magnified 30 times.
 Fig. 9. *Leperditia? Permiana* : left valve of a young specimen ; magnified 38 times.
 Fig. 10. *Leperditia? Permiana* : ventral aspect of a specimen showing lateral compression and marginal rims ; magnified 26 times.
 Fig. 11. *Leperditia? Permiana* : ventral aspect of a more globose specimen, showing marginal rims, punctured ; magnified 30 times.
 Fig. 12. *Leperditia? Permiana* : dorsal aspect of the last specimen ; magnified 30 times.
 Fig. 13. *Leperditia? Permiana* : interior of right valve ; magnified 30 times.

XLVII.—*Investigation of the Generative Organs and Reproduction of the Infusoria.* By M. BALBIANI*.

IN a preceding communication† I had the honour of communicating to the Academy some of the results at which I had arrived in studying the reproduction and development of the Infusoria called *Polygastrica* in the classification of Ehrenberg. In the course of the present spring and summer I have been able to extend my researches to several other species, and to complete some old observations which the want of materials had compelled me to interrupt for a time. The object of the present note is to make known the most essential of these new results, the detailed exposition of which will form the subject of a memoir which I propose shortly to submit to the Academy.

The investigation of the propagation of *Paramecium Bursaria* had led me to assume in this species, independently of a multiplication by spontaneous scission, a second mode which constituted a true sexual generation, and to recognize in the organs described under the names of *nucleus* and *nucleolus* the analogues of the male and female generative organs of the higher animals.

* Translated from the 'Comptes Rendus,' 30 August, 1858, p. 383, by W. S. Dallas.

† See 'Annals,' 3rd series, No. 6. p. 435.

I had also been led, in a great number of cases, to regard what nearly all authors had considered to be a spontaneous division in a longitudinal direction, as a sexual union of two individuals. Very often, in fact, I have been able to ascertain that this state coincided with certain remarkable changes which took place in the internal organs of these animals.

I. The corpuscle which, in the Infusoria, has been described under the name of nucleolus, and which I have shown to be the male genital gland, has hitherto only been indicated in a few rare species. In connexion with this, I have examined a great number of individuals belonging to numerous and varied forms, and I have convinced myself that, far from constituting an exception, the presence of one or even several nucleoles was a nearly constant fact in the different types of this class; but frequently the simple or multiple nucleole which they contain is so intimately confounded with the substance of the nucleus, that it only becomes apparent when it is separated therefrom accidentally by the action of reagents, or spontaneously at certain determinate periods in the life of these creatures, principally at the time of their sexual propagation. I have counted fourteen species in which this organ was very evident to me, and in which I have also been able to follow its evolution, to a greater or less extent, at the breeding season, at the same time that I was an eye-witness of the other actions which concur in assuring the reproduction of these animalcules by fecundated germs.

As regards the number and situation of the testicular organ of the Infusoria, I have met with the following varieties. It is simple, rounded, and lodged in more or less deep depressions of the nucleus in *Paramecium Aurelia* and *P. caudatum*, and also in a third species nearly allied to *P. Bursaria*, but smaller and destitute of green granules. The genus *Bursaria* (*B. leucas*, *flava*, and *vernalis*) also presents a simple nucleole situated in the vicinity of the nucleus. The same thing occurs in *Chilodon cucullulus*. But with regard to the latter, I must remark that I do not regard as the analogue of the nucleole of the preceding species the corpuscle to which M. von Siebold has given this name, and which is placed in the interior of the granular mass of the nucleus, in the centre of a broad transparent zone. The true nucleole or testicle of *Chilodon* appears in the form of a small, rounded, brilliant grain, provided with a proper membrane, and situated quite to one side and towards the middle of the nucleus. It is very easily perceived in large specimens by employing the action of reagents. As regards the nucleus and its internal parts, I make no difficulty in regarding them as representing all the elements of an ovum, of which the nucleole of the celebrated German naturalist would be nothing but the germinal spot. The

disappearance of the clear zone and of its central corpuscle in the animals which have just copulated, especially appears to me to militate in favour of this view.

II. I have met with a multiple testicle in many species belonging to the groups of the *Oxytrichinæ* and of the *Euplotes* or *Plæsconia*, including the highest types of this class. In the genus *Oxytricha* the two nuclei, which are elongated in the direction of the greater axis of the body, are each accompanied by a small, rounded, testicular body, very distinct from the corresponding nucleus. There are also two, placed one to the right and the other to the left of the long nucleus, which is curved into the form of a horse-shoe, in *Euplotes Charon* and *viridis*. In the genera *Stylonychia* (*S. Mytilus*, *pustulata*, and *lanceolata*) and *Urostyla* (*U. grandis*), the nucleoles, to the number of four or five, are distributed in two groups in the vicinity of the nuclei, of which the anterior is accompanied by two, and the posterior also by two or sometimes three of these little organs. They are remarkable from their distinctly rounded outline, their great refractive power, and their homogeneous structure. In *Spirostomum ambiguum*, each of the grains of the long moniliform cord which here replaces the oval nucleus of the other species, gives lodgment, in a deep depression of its surface, to a small rounded corpuscle, which corresponds with the nucleole of the preceding species; this brings the number of testicles in this animal to forty-five or fifty. I have only been able to perceive them in individuals which have been copulating for a certain time, and by employing dilute acetic acid. It is very probable that an analogous arrangement will be found in the other types in which the nucleus is formed of grains placed in a single row, like a necklace, such as *Stentor*, *Kondylostomum*, *Trachelius moniliger*, &c.

III. The evolution of the male genital apparatus of the Infusoria, as just characterized, in the other species of the genus *Paramecium* does not differ from that presented to us by *P. Bursaria*. In the *Oxytrichinæ* each of these organs remains entire, becomes enlarged, and exhibits in its interior, applied against its wall, a thick granular body, furnished with a tubular appendage, which projects into the cavity of the capsule, and appears to be open at its free extremity. This tube, which seems to be an excretory duct, often appeared to be filled with capillary filaments of extreme fineness, arranged parallel to the axis of the duct in question, in which they were fixed by a portion of their length, whilst the remainder, escaping by the orifice of the tube, radiated in all directions in the interior of the capsule. Subsequently the granular body and its duct disappear, and the filaments, becoming free, collect into a bundle, which fills the

whole of the formative sac. Although I have never seen them execute any movements, I do not hesitate in considering them as the spermatic filaments of these animals.

IV. It is with equal certainty that we may call the *nucleus* the female genital organ of the Infusoria, in opposition to the perfectly hypothetical assertion of Ehrenberg, who regards it as the testicle. Its evolution likewise only commences at the time of reproduction, and often during the sexual union itself. In *P. Aurelia* and *caudatum*, towards the end of the copulation, its surface is traversed in all directions by numerous furrows, which, penetrating deeper and deeper into its mass, finally divide it into a great number of unequal and irregularly rounded fragments, having a clear centre more or less surrounded by granules. I should compare these with the first rudiment of a vitellus, and the transparent central portion to a more or less developed germinal vesicle. The fragments thus formed are soon dispersed in the surrounding parenchyma. Here a very small number of them, almost always four, never more and very rarely less, complete their evolution, and soon acquire the appearance of complete and well-developed ova. In this state they present themselves in the form of small brilliant bodies, perfectly equal in volume, slightly oval, and of a bluish-grey appearance. We may very clearly distinguish in them a finely granular vitellus, surrounded by its proper membrane, which separates from it more or less after a few moments' exposure to water. The germinal vesicle and spot are also visible with a distinctness truly surprising, considering that we have to do here with the smallest of living organisms. I have met with these ova still enclosed in the body of the animal on the seventh day after the copulation; they no longer exhibited either germinal vesicle or spot, and their volume had slightly increased. In the allied species, *P. Bursaria*, the reniform nucleus becomes unrolled before breaking up, and in this state resembles the ribbon-shaped nucleus of the *Vorticellæ*. About twenty or twenty-five of the fragments produced from it continue their development and become so many perfect ova. In the nucleus of *Chilodon cucullulus*, also, we observe, after the copulation, the disappearance of the transparent zone with its central obscure spot. In the genera *Stylo-nychia* and *Urostyla* the ova are four in number, as in *Paramecium caudatum*, but they are produced by a different mechanism. Each of the two nuclei divides into two halves, as in the act of spontaneous division; and the four fragments thus produced form an equal number of perfect ova. Lastly, in *Spirostomum ambiguum*, we have seen, in individuals which have been copulating for some time, the forty or fifty grains of the long flexuous cord which traverses the body become rounded and detached from

each other. But we have been unable to discover in these all the characters of an ovum with the same distinctness as in the preceding species, no doubt because they had not yet arrived at their complete development.

V. I have not witnessed the *deposition of the ova* in these animals. It is very probable that they escape by the anus, or by some neighbouring aperture. Thus, in the *Stylonychia*, I have seen them collect in the posterior part of the body which bears the anal orifice, and diminish gradually in number from the first or second day after the copulation. It is a singular thing, that about this period a round pale body begins to make its appearance in the centre of the animal; this becomes constricted about the middle, and reconstitutes the double nucleus of *Stylonychia*.

VI. The Infusoria are destitute of copulatory organs. In most cases the copulation is effected by simple juxtaposition, the two mouths establishing the sexual communication (*Paramecium*, *Bursaria*, *Euplotes*, *Chilodon*, *Spirostomum*). In the *Oxytrichinae* the union is more intimate, and goes so far as to constitute a true soldering of the two individuals for more than two-thirds of their anterior part. Any one who had not witnessed all the phases of this singular copulation, would be unable to avoid regarding this state as a longitudinal division, proceeding from behind forwards, in a single animal. But even, if direct observation were wanting, the concomitant changes of the internal organs, which are so characteristic, cannot leave the least doubt as to the actual signification of this act.

XLVIII.—*Remarks on certain Vermiform Fossils found in the Mountain Limestone Districts of the North of England.* By ALBANY HANCOCK*.

[With six Plates.]

IN 1838, Mr. Dixon Dixon, of Unthank, presented to the Newcastle Museum a few slabs of a fine-grained micaceous sandstone, which were procured from a quarry on Haltwhistle Common. These slabs exhibited on their surfaces peculiar elevated and depressed markings, supposed at the time to be either the fossil remains of worms, or casts of worm-tracks.

Slabs bearing similar markings were likewise obtained by Mr. Edward Wood, of Richmond, in 1850, from the same formation in Wensleydale, Yorkshire, and were described by that gentleman in two interesting communications published in the

* Communicated by the Author, having been read at the Meeting of the British Association held at Leeds, September 22, 1858.

1st vol. of the 'Naturalist,' in which the nature of these curious fossils is discussed, and the conclusion arrived at that they are worms, though to what order they belong is not determined. Mr. Wood, however, no longer entertains this opinion. In a letter which I had the pleasure of receiving from him a short time ago, he states that these fossils "are assuredly the track-tube or burrow of some creature, and probably, as you say, of a crustacean." And in the same communication Mr. Wood further says, "I sent a specimen to the Museum in Jermyn Street, and the lamented Edward Forbes had it marked 'Casts of Annelide-tubes,' and it is so marked still."

Shortly after the appearance of Mr. Wood's communications in the 'Naturalist,' Mr. John Dixon gave an account in the same journal of what he supposed to be another species of fossil worm, procured in the flagstone beds of Pateley-Bridge, Yorkshire, "a deposit similar in general composition to those of Wensleydale."

More recently, Mr. Howse has obtained from Weardale similar fossils; and I am indebted to that gentleman for the loan of several interesting specimens, both from that locality and from Haltwhistle.

As far as I have been able to ascertain, the papers above referred to contain all the information that has been published on these worm-like fossils of the Carboniferous system; but the prevailing opinion appears to be that they are the remains of worms, or are the casts of worm-tracks; and indeed, at first sight, their general appearance would seem fairly to justify such a conclusion. On careful inquiry, however, it appears to be untenable; and there is good reason for believing that they are the runs or tracks of crustaceans.

Some years ago, whilst walking along the beach at Cullercoats, my attention was arrested by some track-like markings on the sand, which resembled most remarkably these so-called fossil worms. So striking was the similarity, that I at once commenced an examination of them, in the hope that they might throw some light upon these enigmatical fossils; and I soon satisfied myself that the tracks on the beach, at all events, were in no way connected with worms, though, at the time, I entirely failed to ascertain how and by what they were produced. I then lost sight of the subject; and it was not until the autumn of last year, during a lengthened sojourn on the Durham coast, that my attention was again directed to these beach-markings. On this occasion I found them in great profusion on the Whitburn Sands, and in every respect similar to those previously observed at Cullercoats. They are, in fact, to be found on every sandy shore in the neighbourhood of the Tyne and Wear, occurring very abundantly on the sands at Tynemouth, Whitley, South

Shields, and Whitburn. In these localities they are to be seen everywhere between tide-marks, but are most numerous about half-way down the beach, on inclined, oozy, glistening spots, where the sand is firm, and yet the moisture so profuse that it mirrors the light.

In such situations they are very numerous and complicated. There are two or three species, the largest (Pl. XIV. fig. 1) of which is about three-eighths of an inch wide; it is slightly raised above the general surface of the beach, and is of a flattened, ribbon-like form, with a narrow median groove (*a*) running from end to end; it is occasionally several feet in length, winding in a very intricate manner, and is frequently and irregularly convoluted, forming, as it were, loose knots or systems in which neither the commencement nor the termination can be easily detected, and which are usually connected together by lengthened, slightly undulated portions of the track. The windings are, for the most part, well rounded, and in their course occasionally, but rarely, exhibit inconspicuous, arched, transverse ridges (*c*). The tracks also occasionally show enlargements placed at some little distance from each other (fig. 2 *a*); when this is the case, there is no median groove. Another variety occurs, but not frequently, in which there is neither groove nor nodulous enlargements. The extent and complication of the windings vary considerably; and though they are for the most part exceedingly intricate, as above described, they are at times found of much less extent, and comparatively simple, so that they can be followed easily enough throughout their sinuosities. At other times they may be seen, as it were, entirely unravelled, running a considerable distance in an undeviating or only slightly tortuous line.

Besides the above, another kind of track, also very abundant, is found on our shores; it is, however, very different in character, and is much smaller. It (Pl. XV. fig. 1) is in the form of a narrow wedge-shaped furrow (*a*), about two-tenths of an inch wide, with the margins occasionally a little elevated (*b*, *b*). Its windings are very capricious, irregularly rounded, frequently abruptly angulated, and sometimes for a considerable distance finely and regularly undulated or zigzagged (fig. 2). This species is often found in close proximity to the broad form previously described; but occasionally it occurs high up on the beach, and in pools and small hollows between the ripple-ridges. In such situations, however, it is not confined to the bottom of the hollows, but likewise passes up the sides of the bordering ridges.

A third variety (fig. 3) is occasionally seen, much resembling the last both in size and windings; but the furrow (*b*) is smaller

and comparatively inconspicuous, and the sand is thrown up on one side into an arched or rounded ridge (*a*), which sometimes almost obliterates the furrow. The ridge itself is frequently broken up into nodules (fig. 4), thus giving to the whole track a beaded or articulated appearance. At each articulation a puncture is occasionally observed in the furrow.

These tracks, as just described, may be observed by any one who will take the trouble to look for them; but it is not quite so easy to determine how and by what they are formed. It was long before I could ascertain these facts, and they were at length determined only after some careful watching; nothing, however, is required but time and a little perseverance. The complication and extent of the tracks are the main difficulties; on this account it is impossible to keep in view at the same time all their numerous windings, and in most cases the extremities are not to be seen. I therefore went down to the beach just as the tide was leaving the spot where the broad or first-described tracks were usually in great profusion. The sand was quite smooth, all irregularities having been obliterated by the action of the water. Here and there, however, the tracks had already made their appearance, but were as yet of very limited extent, and there was now no longer any difficulty in taking the whole in at one view, and, moreover, the extremities were perfectly distinct. It was only necessary to watch attentively to note the formation of the numerous and labyrinthine windings that had been so long a puzzle. I had not to wait long before the sand at one of the extremities was observed to be gently agitated; and on this agitation ceasing, the track was found to have added nearly half an inch to its length. In the course of two or three minutes the sand was again put in motion, and the track once more a little prolonged. These movements were repeated over and over again, until it was quite clear that the tracks were formed by slow, intermitting steps, and not, as might have been supposed, by one continuous, gliding motion. Having satisfied myself of this, I took up the morsel of sand at the end of the track, just as it was again becoming agitated, and found that I had captured a small crustacean, the species of which was unknown to me, though in general appearance it was not altogether unlike the common sandhopper, but not quite so long. It was undoubtedly one of the Amphipoda. I soon took in this way five or six specimens, all of the same species, and all forming tracks of precisely the same character,—namely broad, slightly elevated, flattened, and grooved.

Whilst forming its track, the animal is never seen; it moves along a little beneath the surface of the sand, which it pushes upwards with its back; and the arch or tunnel thus formed

partially subsides as the creature passes forward, and, breaking along the centre, the median groove is produced.

I now turned my attention to the narrow or furrowed tracks, and in the same manner took several specimens of another species of crustacean, much smaller than the first, but having some general resemblance to it. This species, like the former, makes its track step by step, resting some little time between each advance, but differs from it in having its back exposed to view while moving; on account of its colour, however, it is very difficult to distinguish from the sand.

The captured individuals were placed in a shallow vessel with the bottom thickly covered with sand moistened with sea-water, so as to resemble as nearly as possible the state of the beach where the tracks are found; and I soon had the satisfaction of seeing them make their tracks or runs in a state of confinement, thus making assurance doubly sure. The tracks so formed were precisely similar to those seen on the beach; but in one instance an interesting modification was observed. I was watching the movements of an individual of the larger species, when all at once it thrust itself through the surface of the sand, and sinking immediately again, left there an oval swelling; and repeating this action five or six times, formed a series of nodules (Pl. XIV. fig. 2 *b*), which, if continued, would have produced a track of a peculiar articulated appearance, much resembling on a large scale the nodulous or beaded form already noticed as sometimes occurring in a variety of the narrow, furrowed kind.

Specimens of the two crustaceans which make these runs have been submitted to Mr. C. Spence Bate; and he obligingly informs me that the larger one (that which makes the broad, elevated tracks) is a scarce animal, and was described by him, under the name of *Bellia arenaria*, in the 'Annals of Natural History' for 1851; but the name was afterwards changed to that of *Sulcator arenarius*. He alludes to its habit of making tracks in the sand. The smaller animal he states to be an undescribed species of the genus *Kröyera*, for which he proposes the specific denomination of *arenaria*. Both species will be figured and described by that gentleman in the 'Transactions of the Tyneside Naturalists' Field Club' for 1858.

It has been already pointed out that the tracks, which we have just seen are made by these crustaceans, are remarkably similar to the vermiform impressions observed on the Carboniferous slabs. Indeed, the broad raised track (Pl. XIV. fig. 1) produced by *Sulcator arenarius* so closely resembles some of the fossils, that it is difficult to say in what they differ. The description previously given of the former might, in fact, do very well for

the latter; only they are rarely so complicated. There are four kinds of these fossil tracks.

The first (Pl. XVIII. *c, c, c*) is in the form of a simple furrow, with a narrow ridge on each side; it is small, measuring scarcely more than one-eighth of an inch wide, and has a wandering, undulating course, which, however, is never very much complicated, and is confined to the same horizontal plane.

The second, which is a little wider than the above, is smooth, cylindrical, and tortuous, and usually remains in relief on the lower slab, but occasionally dips a little beneath the surface.

The third (Pls. XVI. & XVII.) is irregularly cylindrical, and though sometimes much undulated, is never convoluted or very complicated; it is not strictly confined to the same horizontal plane, but frequently sinks a little below the surface. Full-sized specimens are half an inch wide, and are composed of a series of nodules (*a, a*), which give them an articulated appearance. The nodules, which vary a little in size, are usually about half an inch long, and are not very symmetrically or regularly formed; consequently the surface has generally an imperfect or worn character. The extremities are not often seen; they are abruptly and irregularly rounded. This is the form more particularly described by Mr. Wood, who has in his possession the fine specimen figured in Pl. XVI., which measures nearly eight feet in length, though neither extremity is perfect.

The fourth form (Pl. XVIII. *a*), which seems to be the dominant one in Northumberland, and is that figured and described by Mr. John Dixon, is, as far as I have been able to ascertain, usually in relief upon the upper surface of the lower slab, from which it never deviates; it is considerably depressed, grooved (*b*) or ridged (Pl. XIX. fig. 1 *a*) along the middle line, and is occasionally very long. The specimen figured in Pl. XVIII. measures upwards of six feet in length, but was probably much longer, for the extremities are not present. In fact, it has not yet been determined to what length these fossils extend, as none hitherto measured have had both ends perfect. Large specimens are frequently an inch wide, and generally much undulated, and occasionally, but never intricately, convoluted. Such have the surface most frequently marked with numerous, regular, rather fine, transverse striæ or arched ridges (Pl. XIX. fig. 2), which are sometimes very delicate and close-set, though they vary in these particulars, and are occasionally coarse and irregular, giving to the whole surface a wrinkled appearance. Small specimens (fig. 1), on the contrary, are frequently wound up in an intricate manner, the folds being well rounded and often convoluted; but the surface is never marked with transverse lines or wrinkles.

It is this last form, particularly the smaller and more complicated variety, that so closely resembles the track of *Sulcator arenarius* (Pl. XIV. fig. 1). The folds or windings are precisely similar, and so is the median groove. It differs chiefly in being occasionally much larger, and in rising up more boldly in relief from the matrix, though in these respects they sometimes closely approximate. Dimensions, however, can be of very little consequence; for of course the larger the animal, the larger the track. The relief may also be influenced by other conditions; the quality of the substance in which the tracks are made must likewise be taken into account.

The crustacean, as we have seen, forces itself onward immediately beneath the surface of the sand, which is thrust up by its back, and as it moves along, a sort of arched tunnel is thus formed; but as the sand is incoherent—unmixed as it is with any material that could give it consistency—the roof falls in immediately the animal ceases to give it support, and ultimately the relief of the track is very small. As the arch falls, it must either break along the centre or thrust out the sides; the latter is impossible—hence the median groove. Had the beach been composed of sand with a large admixture of argillaceous matter or tenacious mud, it is very obvious that the tunnel would have had a greater tendency to retain its original form, and that, had it been submerged before it had subsided to any great extent, such an infiltration of matter might have taken place as to prevent any very extensive collapse. The roof, under such circumstances, would split along the centre, and the margins of the fracture would either fall inwards and form a groove, or be pressed outwards and become a ridge. It is also possible to conceive that the substance composing the shore might be so tenacious that the roof of the tunnel would scarcely subside at all, and that consequently there would be no fracture along it, and therefore neither groove nor ridge.

Now, these cases, which are hypothetical so far as they concern our crustacean tracks, do not appear to be so in regard to the conditions that prevailed during the deposition of the Carboniferous rocks which have revealed to us these curious vermiform fossils. The rocks from which the Yorkshire specimens were procured are, Mr. Wood says, “apparently equivalent to the flagstone beds placed by Phillips, in his section of the hills about Howes, low down in the middle group of the Yoredale series, and called by him the flagstone beds of Howes.” And, in speaking of the nature of these flagstones, Professor Phillips states, in his work on the ‘Mountain Limestone District of Yorkshire,’ that they are formed of “a laminated rock, composed of small worn grains of quartz, mica with or without felspar,

and other minerals, occasionally calcareous, carbonaceous, and argillaceous: the mica or carbon, lying in particular planes, causes the minute fissility of the stone; and bands of mica or argillaceous matter separate it into thin flags or beds. The tops and bottoms of gritstone rocks are often thus laminated; plates becoming very sandy change to flagstone; grit rocks becoming very argillaceous assume the same character." It would thus appear that these fossiliferous slabs, which are composed of a finely-laminated, shaly, compact, close-grained, micaceous sandstone, contain argillaceous matter. The slabs from Northumberland have exactly the same composition, and apparently belong to the same series of rocks. It is fair, then, to assume that the matter composing these flagstones was originally of a more tenacious consistency than the sand of our shores, and therefore, were the tracks found on the slabs made by even the very same crustacean that occurs on our coast, some differences might be expected to exist between such tracks and those formed on the beach.

Such differences, we have seen, are very slight, and may all be accounted for in this way. The greater tenacity of the material at once explains the higher relief of the fossil, the occasional substitution of a ridge for the median groove, and the deficiency of either groove or ridge in those whose relief is so excessive as to have become almost cylindrical. A similar smooth variety, as previously stated, sometimes occurs on the beach; but this arises from the fact of the crustacean having tunneled deeper than usual, and in this case the relief is not great. Smooth tracks are also found on the slabs, arising, probably, from the like cause.

The specimens described by Mr. Wood are characterized, as we have seen, by a remarkable nodulous or articulated appearance (Pl. XVI. *a*, *a*), which has been supposed to indicate the presence of rings of some Annelide; and, indeed, were it not for the light derived from the crustacean tracks on our shores, it would not be easy to conjecture a more plausible explanation. We have seen, however, that a variety of the track of *Kröyera arenaria* has the ridge of sand thrown up broken into nodules, giving to it a beaded character. This, on a small scale, has a considerable resemblance to these nodulous forms. But a much nearer approximation is found in the nodulous tracks of *Sulcator arenarius*, particularly of the one made in confinement (Pl. XIV. fig. 2 *b*). Had the animal continued to form its track in this manner, the resemblance to those on the slabs would have been almost complete. It may therefore be assumed that the animal which made those nodulous tracks, like our small crustaceans, pushed along in its path step by step, resting awhile after

each advance,—but that, instead of moving in the same horizontal plane, it alternately rose and sunk a little; consequently a series of nodules was produced, and the track acquired its peculiar articulated appearance. This explanation is strengthened not a little when we look at the side view of the cast of the track (Pl. XVII. fig. 2). The nodules are then distinctly observed to be imbricated, and to pass, very much inclined, right through the substance from top to bottom.

We see in the ridged variety of the track of *Sulcator arenarius* another approximation to the nodulous form; at *c*, Pl. XIV. fig. 1, a few of the transverse ridges of this variety are represented, from which it will be seen that the articulated appearance is very slight, and it is pretty obvious that it is produced by the intermitting progress of the animal—the transverse arched elevations or ridges undoubtedly indicate the successive steps in the creature's path. These ridges, too, have much the character of the transverse striæ or wrinkles that cover the surface of most of the larger fossils; and it seems not altogether impossible that the latter were produced in the same manner, though they are much more closely set. It is more probable, however, that these ridges in the fossil were caused by the crumpling of the roof of the tunnel as the animal pressed forward with a short, jerking motion. And here it must be borne in mind that these transverse ridges, which in some individuals are strong and well-defined, and even coarse and irregular, in others are exceedingly delicate, and are occasionally entirely wanting. This is usually the case on slabs dark with excess of carbonaceous matter, indicating that the sedimentary material of which the rock is composed was light and incoherent; consequently the specimens on such slabs are not only devoid of those peculiar ridges, but are also in very low relief, some being quite as little elevated as the tracks on the sea-beach.

The cast of the nodulous track occasionally detaches itself entirely from the matrix (Pl. XVII. fig. 2). Mr. Wood informs me that a blow with a hammer is very liable to separate the specimen from the rock, leaving a cast on both the upper and lower slab; and in his first paper he remarks, "If the appearances above spoken of are but markings, how could they show a circular form on both the upper and lower surfaces?"

This at first sight seems a formidable difficulty; and were the tracks such mere superficial markings as is there supposed, this objection would be fatal to the view now taken with respect to the nature of these fossils. It has been shown, however, that the track of *Sulcator arenarius* is a tunnel; and with the aid of this fact, the difficulty at once disappears. If the tunnel-tracks were formed in a tenacious material, such as that from which these slabs have

apparently originated, their walls, as we have seen, would not entirely collapse, but the cylindrical form would be more or less retained. It is therefore fair to suppose that the sedimentary matter, as it was being deposited, would gradually find its way into these lengthened tunnels or burrows after their submergence, and ultimately fill them up; but, the particles of such infiltrated matter having a different arrangement from those forming the general mass of the rock, the phenomenon presented on breaking it up into slabs would necessarily occur: the casts of the tracks would become isolated like the fossil remains of any organic body, or might be left in relief on either the upper or lower slab.

The nodulous form, however, differs from the broad grooved species in not keeping strictly to the same horizontal plane; it undulates slightly vertically as well as horizontally, so that the burrow is occasionally sunk entirely beneath the surface. In such cases, as the tunnel cannot be formed by thrusting up the surface, the animal must, as it presses forward, throw the excavated matter backward, filling up the tunnel, either entirely or partially, as fast as it is made. But here, too, as the particles in the interior of the tunnel must have a different arrangement from those that surround them, the cast of the track would be liable to become isolated, on breaking up the rock, in the same manner as if the burrow had been completely filled with infiltrated matter.

It is worthy of remark, that the nodulous forms, which have neither median ridge nor groove, are rarely depressed, being frequently cylindrical, and even sometimes deeper than wide. This is just what might be expected, if the explanation now given of these fossils be correct. At the junction of the nodules there are septa formed (Pl. XVII. *f, f*), which pass for some little distance inwards, and which may be looked upon as so many transverse arches, giving support to the walls of the tunnel. These must naturally assist in preventing their collapse, and will in this way account not only for the cylindrical form of these specimens, but also for their deficiency of median groove or ridge. Their occasional greater or less depth below the surface of the matrix must also have been favourable to the preservation of their original form.

The foregoing observations are entirely confined to the tracks having a tunnel-form. We have seen, however, that there is another kind which occasionally occurs on the slabs from Northumberland. This is the first described species (Pl. XVIII. *c, c, c*), and is, as before stated, a simple furrow with a narrow ridge on each side. It is certainly possible that this may have been formed in the same manner as the others, and that the

groove may indicate the falling-in of the roof of a tunnel; but from its great similarity to the track of *Kröyera arenaria*, it is more probable that, like it, it is a mere surface-run formed by the exposed animal ploughing its course. However this may be, its nature cannot be questioned; it is undoubtedly a track, and so closely resembles those of the crustacean as scarcely to leave room for the interrogation, Of what? It is hardly to be doubted that they belong to some animal of that class.

From the above observations we seem justified in concluding that these curious vermiform fossils are the tracks of crustaceans; but before doing so, it would be well to inquire how far they are likely to be the remains or tracks of worms, or worm-tubes, or any other organic body.

In the first place, the enormous length of the grooved and nodulous forms is rather opposed to their being the remains of worms. Of course this does not militate against their being worm-runs, though the great width they sometimes attain does not at all favour that opinion. The width of the largest specimens of the grooved form is a little over an inch, and of the nodulous species about half an inch; their length may be three, ten, or twenty times greater than the measurements before given, as none of the larger specimens, as already stated, have yet been obtained with both extremities perfect. Size alone, however, is not sufficient to debar the possibility of their having been formed by worms; but, upon such a hypothesis, how are we to account for the peculiar character of the nodulous form? It is impossible to comprehend how the nodules, which are imbricated, passing diagonally through the track, could have been produced by a worm working its way through sand, mud, or any other material whatever. With respect to the grooved form, it may also be asked, do worms or any of the Annelides ever make runs at all similar to it? I know of no instance of any of these animals making a tunnel-track immediately beneath the surface of the beach, confined to the same horizontal plane, and with an elevated, arched roof. Annelides do not move along the surface in this manner; and when they burrow, they dip downwards, making perfectly circular passages.

The small furrowed kind, for size, might very well be the track of some worm; but its close resemblance to the runs of crustaceans has already been pointed out. With regard to the small cylindrical runs, not much can be said, as they are too deficient in character to allow of any very decided opinion; only we have seen that on the beach there are elevated cylindrical tracks produced by crustaceans not very dissimilar to those in question.

Can the two former or large species be worm-tubes, or any organic body? The transverse striation on the surface of the grooved

form certainly gives to it much the appearance of some organism. An endeavour, however, has already been made to explain the nature of this peculiar character; but whether successfully or not, there is sufficient evidence to prove that these fossils are not organic. The slabs exhibiting these vermiform tracks are frequently marked with numerous small pits or punctures, which sink for a short distance beneath the surface. These (Pl. XVII. *c, c*) have somewhat the appearance of what have been termed by geologists impressions of rain-drops. In this instance, however, they are undoubtedly produced by the animals which have made some of the smaller tracks, as it is not uncommon to see the latter terminate in one of these punctures (*e, e*). Now, it occasionally happens that the large or striated fossils are perforated by these punctures; and the scars thus made are similar to those in like manner formed on the other parts of the slab. This could hardly be so, had the slab and the fossil been originally composed of two different substances,—that is, had the former been nothing but sand or mud, and the latter a worm-tube or some other organic body.

Another fact equally instructive may also be cited. The slab in the Newcastle Museum previously alluded to exhibits not only the large grooved track, but also several of the small furrowed ones; and the latter frequently pass over the former in various directions (Pl. XVIII. *c, c, c*). The nature of the small species is not likely to be disputed: it is certainly a track of some kind; and it is remarkable that it never turns aside as it approaches the large grooved form, but passes over it at once, ploughing its way exactly in the same manner as it has done on the level portions of the sandy beach. The furrow is precisely of the same character, form, and depth, whether on the slab or on the track; and the ridge thrown up on each side is in no respect dissimilar. This seems a pretty conclusive proof that this large vermiform fossil is not a worm-tube or any organic body, but is really nothing more than a track which was, in fact, originally, as it is now, composed of the same material as the slab upon which it rests; otherwise the appearances as above described could not exist.

There still remains another very conclusive argument against the organic nature of these fossils. The folds or windings of both the grooved and nodulous forms occasionally cross each other; and when they do so, the one does not lie over the other, as it must necessarily have done were they organic, but passes right through it, cutting its own path (Pl. XVII. *b*). This is still more clearly demonstrated in the fine large specimen of the nodulous form previously alluded to (Pl. XVI. *b, b*), and appears only explicable on the hypothesis of their being mere tracks. And perhaps it will now be allowed that enough has been said to establish the high probability, at least, that they were formed by

crustaceans; it therefore only remains to be ascertained whether they can be attributed to any known fossil of the Carboniferous rocks.

Mr. Howse has suggested to me that they may be the runs of Trilobites, several species of which occur in this formation. This is not by any means unlikely. It is true, I believe, that these curious crustaceans have never been found in the rocks in which these tracks occur. They are most abundant in the lower members of the Carboniferous system, though they occasionally occur higher up in the series. Professor Phillips, in his work on the 'Mountain Limestone District of Yorkshire,' gives Alston Moor as one of the localities of *Asaphus gemmuliferus*; and I am informed by Mr. Howse that he has obtained in Tynedale two or three specimens of a Trilobite from a plate bed a little above the Scar limestone of Forster's section; and he further states that the Yoredale rocks correspond exactly to the Wear-dale series above Stanhope, that is, from the little limestone to the Scar limestone, and that the specimens of tracks procured in Weardale are from the slaty *Hazle* immediately above the latter—a position agreeing with that of the beds in the neighbourhood of Howes. The tracks from Haltwhistle are, he likewise states, from a slaty *Hazle* just above the little limestone.

It is therefore of no great moment that Trilobites have not been found in the strata from which these vermiform fossils are obtained, since they have been procured from the associated beds. And it is a remarkable fact that no remains whatever of any organic body are found in these flagstones; yet is there not sufficient evidence to prove that life abounded in the seas from which these rocks were derived? Numerous Trilobites might have existed during their deposition, and may have perished with the other inhabitants of those seas, leaving no trace behind them, except these, as it were, footprints in the sand. Many such footprints are all that is left in the world's stony record of existences that have passed away; and so it may be with these fossil tracks.

The Carboniferous Trilobites, however, correspond very well in size to the tracks, the largest of the grooved kind of which, we have seen, is a little above an inch wide. The width of the pygidium of *Phillipsia truncatula* is stated to be eleven lines,—that of the cephalic shield would probably be a little more; therefore, if allowance be made for the thickness of the tunnel-wall, and the necessary enlargement of the calibre beyond the width of the animal, it is evident that, so far as size is concerned, the largest tracks might be attributed to this species.

The nodulous tracks are not more than half an inch wide; there can therefore be no difficulty as to size with respect to

this form. The *P. gemmulifera* has the pygidium five lines wide; so has *Griffithides calcaratus*; and two or three other species are described to be about the same size. And, moreover, the large cephalic shield, with its anterior or head-tubercle (glabella) and projecting "cover of the eyes," appears well calculated to plough its way beneath the surface of the sandy or muddy beach. And it is worthy of remark, that in some of the tracks the central portion is considerably elevated, forming the upper surface or roof into three areas—a central elevated portion (Pl. XIX. fig. 2 *a*) and two comparatively depressed lateral portions (*c, c*). The former, which appears to correspond to the glabella, is grooved (*b*) along the middle line; and in one or two instances this elevated portion has occurred broken up into a series of irregular nodules (*e, e*), as if the animal had, at each step in its progress, thrust the head upwards, bulging out the walls of the track. The lateral portions in these cases are likewise raised up into irregular ridges at each nodule.

Burmeister, indeed, in his work on the 'Organization of Trilobites*,' expresses an opinion that their habits, like their structure, resembled those of the *Phyllopoda* (a tribe of the Entomostraca), and that they "moved only by swimming in an inverted position close beneath the surface of the water, and did not creep about at the bottom, as Klöden supposed." Though their habits may have been similar to those of the *Phyllopoda*, there does not seem any good reason for asserting that there was no deviation in this respect. Indeed, the organization of the two groups differs in so many particulars, that some variation in their modes of life might naturally be looked for. The Trilobites may have occasionally swum at the surface as supposed, and also have burrowed in the mud or sand at the bottom of the water or on the beach. Season, too, may have modified their habits in these respects.

I have now, before concluding, only to express my obligations to Mr. Wood for all the trouble he has taken to furnish me with information on the subject of these remarks, and likewise for the great exertions he has made to supply specimens for illustration. My acknowledgments are also due to Mr. Howse for similar assistance.

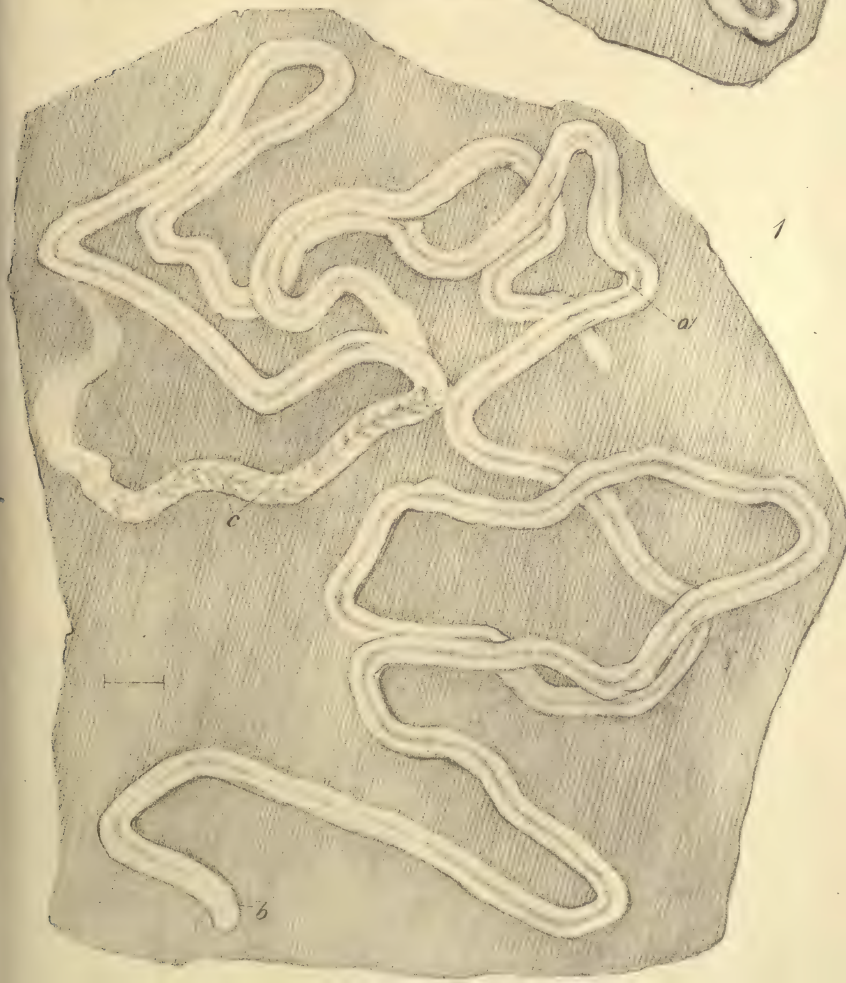
EXPLANATION OF THE PLATES.

PLATE XIV.

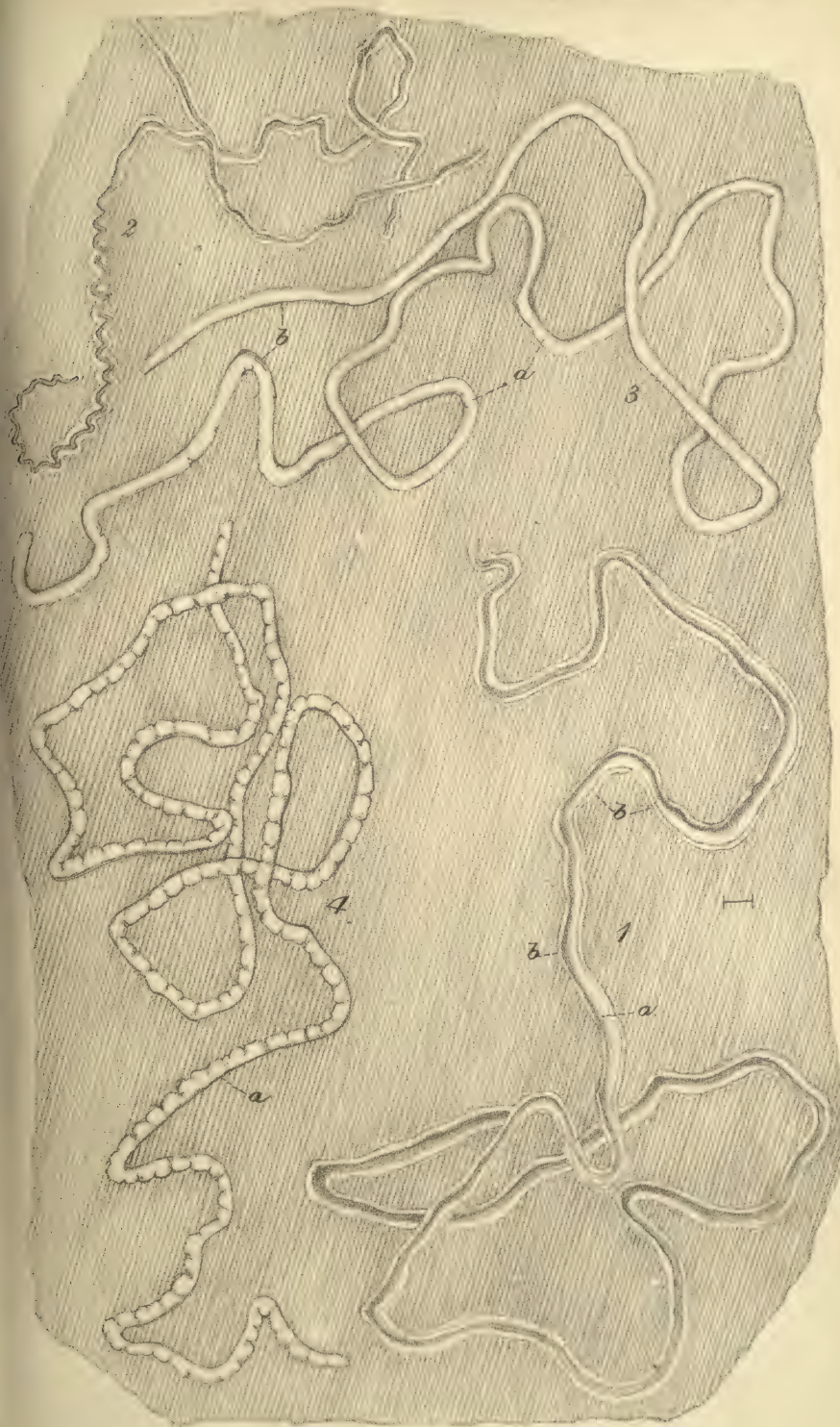
Fig. 1. Broad, grooved track of *Sulcator arenarius*: *a*, groove; *b*, one of the extremities; *c*, inconspicuous arched ridges, which occasionally occur.

Fig. 2. *a*, Nodulous track of ditto; *b*, ditto, ditto, made in confinement.

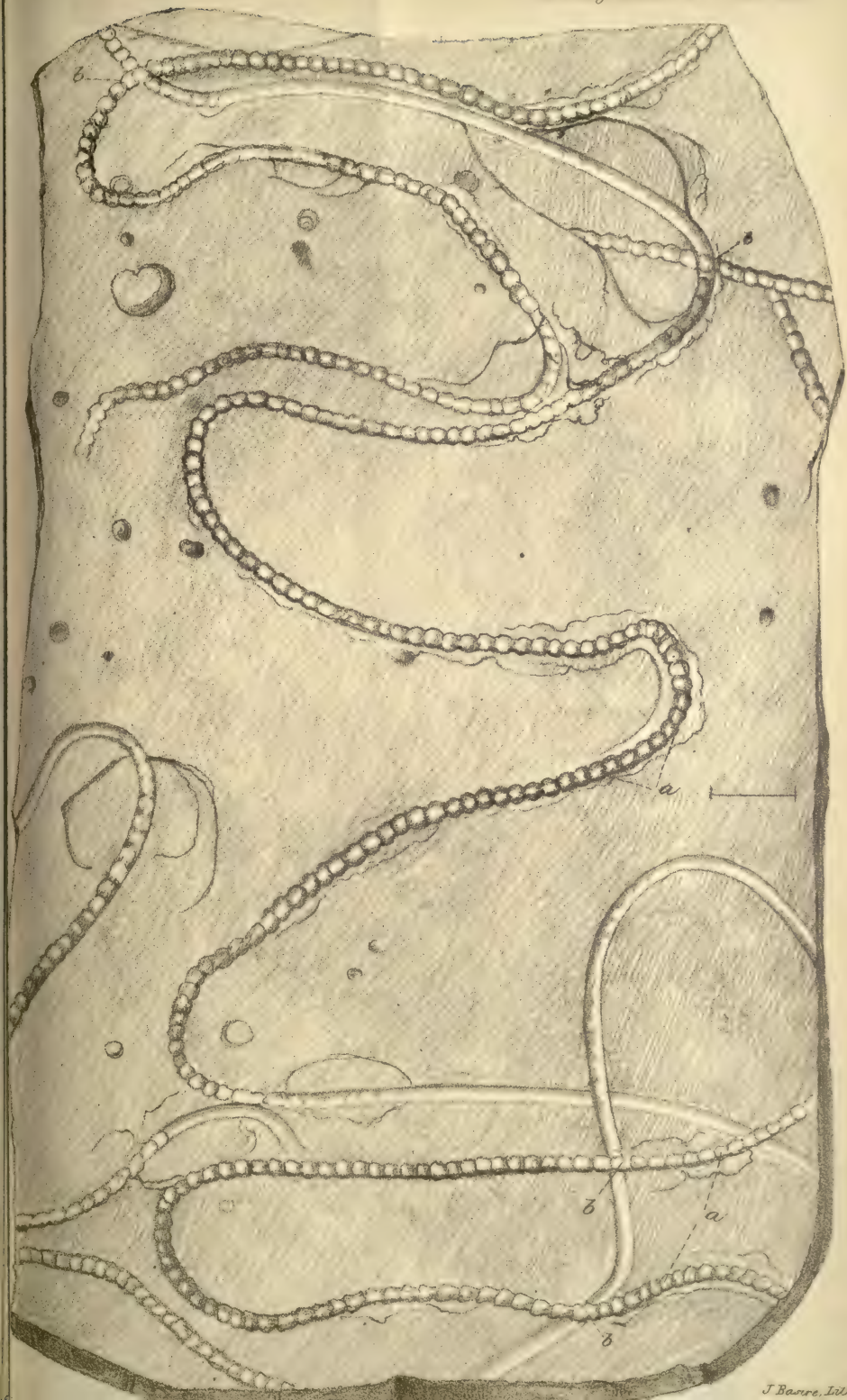
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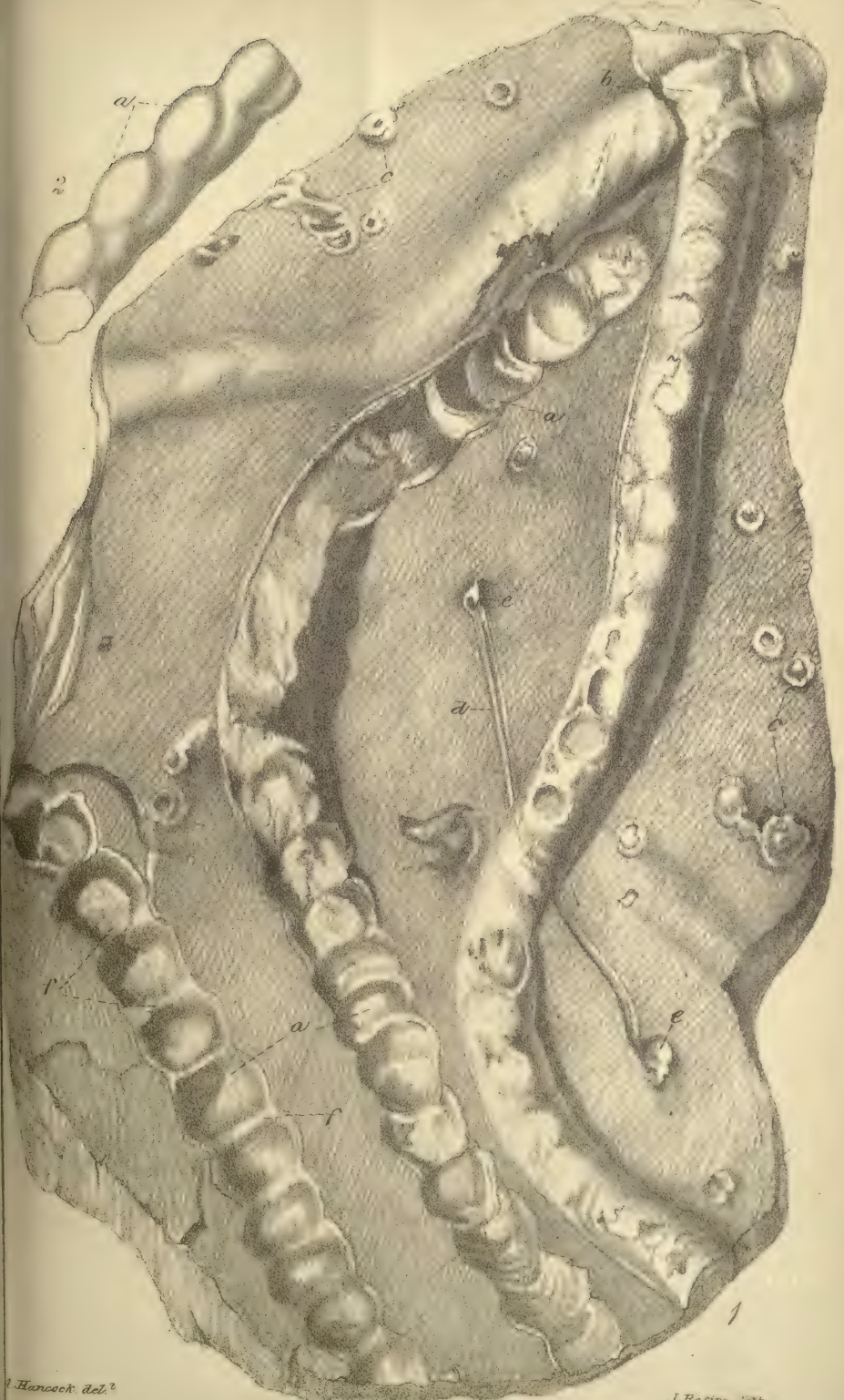




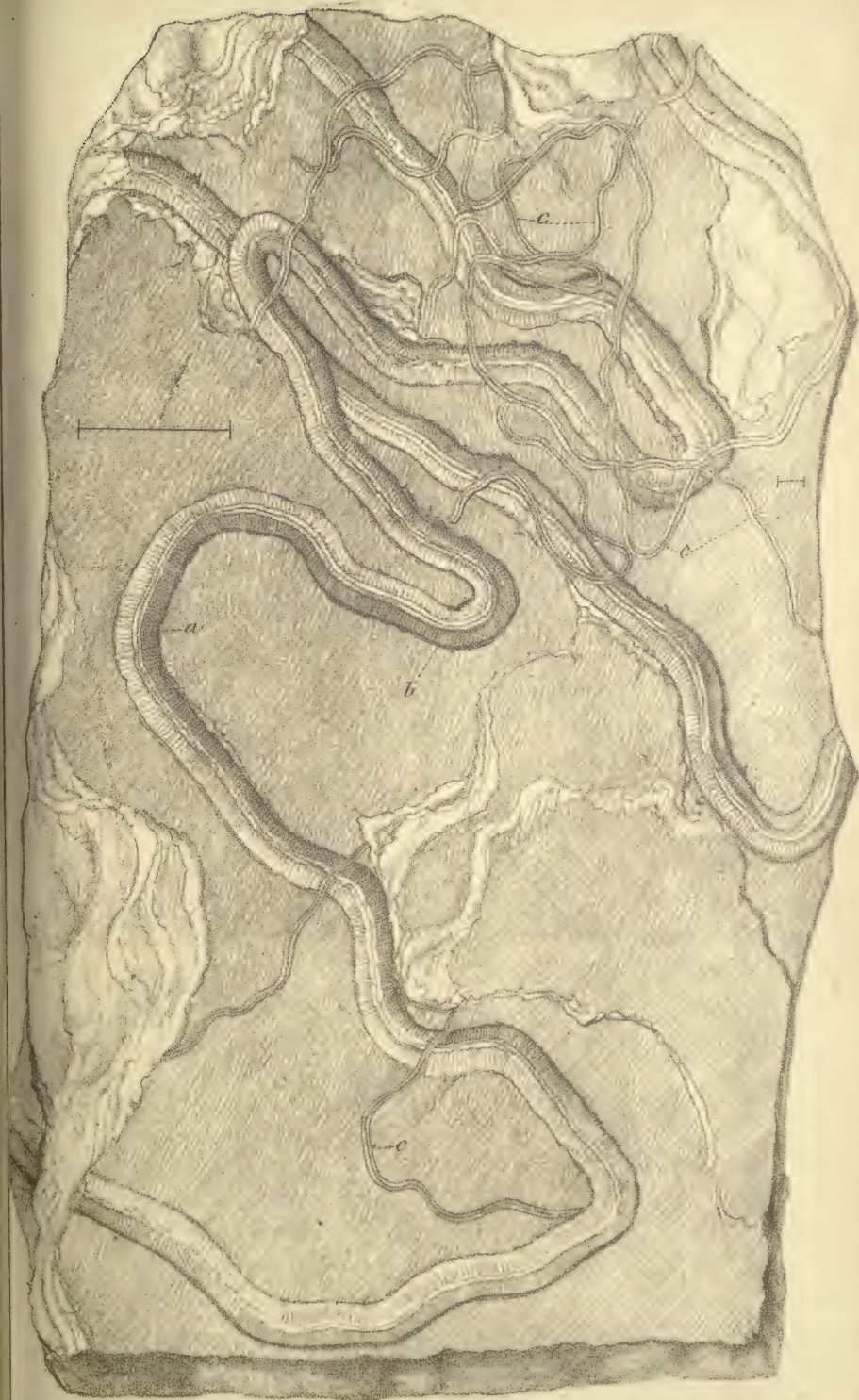














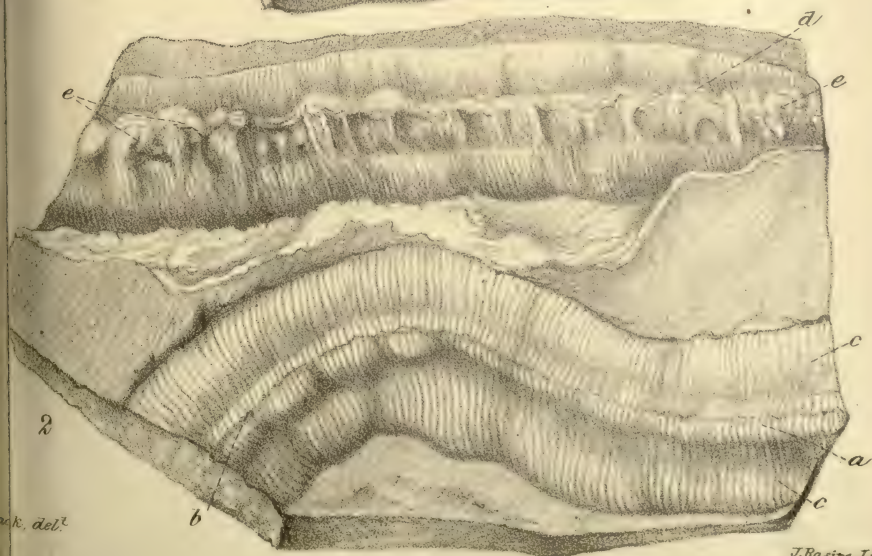




PLATE XV.

- Fig. 1.* Narrow furrowed track of *Kröyera arenaria*: *a*, furrow; *b, b*, slight lateral ridges.
Fig. 2. Variety of ditto, regularly zigzagged.
Fig. 3. Track exhibiting a rounded ridge, *a*, with a narrow lateral furrow, *b*.
Fig. 4. Ditto, with the ridge broken up into nodules; *a*, groove.

PLATE XVI.

Reduced view of a slab, bearing nodulous tracks, in the possession of Mr. Wood: *a, a*, nodules; *b, b*, points where one fold or winding cuts through another.

PLATE XVII.

- Fig. 1.* View of a slab exhibiting nodulous tracks, with the cast of the burrow partially removed: *a, a*, portions of the tracks with the cast removed, showing impressions of the nodules; *b*, ditto, ditto, showing one track passing through another; *c, c*, supposed sinkings or perforations of small crustaceans; *d*, a small track terminating in similar perforations, *e, e*; *f, f*, septa dividing the nodules.
Fig. 2. Side view of a portion of the cast of the same track, showing the nodules, *a*.

PLATE XVIII.

Reduced view of a slab in the Newcastle Museum, exhibiting tracks: *a*, large, depressed, grooved track; *b*, groove of ditto; *c, c, c*, small furrowed tracks passing over the large grooved species in various directions.

PLATE XIX.

- Fig. 1.* View of a slab, of the natural size, in the possession of Mr. Howse, bearing a small, much-convoluted variety of the large grooved track: *a*, central ridge.
Fig. 2. Portions of a variety of large grooved track, of the size of nature, showing a central elevated area and transverse striæ or ridges: *a*, central elevated area; *b*, central groove of ditto; *c, c*, lateral areas; *d*, portion of another track, exhibiting the central elevated area broken up into nodules, *e, e*.

XLIX.—*Notes on Birds.* By T. C. EYTON, Esq., F.L.S. &c.

[Continued from vol. xvii. p. 313, 1st series.]

No. VII. *On a peculiar Process attached to the Ischium in Erucivores.*

It is now some time since, in my own collection, I separated the Cuckoos from other Scansores under the above name, which was first proposed at the Meeting of the British Association lately held at Leeds; but it was only a few days ago that I dis-

covered a process attached to the anterior edge of the ischium, which exists throughout the whole order of Erucivores, and is not found in any other group that I am aware of, thus distinctly marking the Cuckoos as an isolated group. The process alluded to is a lengthened and flattened spine attached to the edge of the anterior extremity of the ischium; it varies much in development in different genera, being lengthened among the Turacoos and Ground Cuckoos, and least developed, but still apparent, in *Chalcites* and *Cuculus glandarius*; but, however rudimentary, it is always present in every genus of Cuckoos that I have examined.

During Professor Owen's lecture at Leeds on the Fossil Marsupials of Australia, it struck me as not being unlikely that some form approaching to marsupial structure might be found in the skeletons of birds. On my return home, I examined minutely the Meliphagidæ (thinking that, the metropolis of that family being Australia, some peculiarity might occur among them), but without meeting with anything striking. In mounting a specimen of the skeleton of *Turacus gigas*, sent to me in spirits, several years ago, from Africa, by Mr. Fraser, the process alluded to first struck me. In this bird it is more developed than in any other of the group with which I am acquainted, except perhaps in *Centropus phasianellus*, projecting from the anterior extremity of the ischium nearly half an inch, and with a nearly obliterated suture between it and that bone, and holding precisely the same position that marsupial bones do among that peculiar class of Mammalia. Although I have, up to the present time, failed to discover a similar structure in birds now classed in other orders, I should not be in the least surprised at doing so, were it not for the mode many genera of Cuckoos adopt in depositing their eggs—some laying them in the nests of other birds, while several females of other species deposit them in a common nest. Little or nothing, however, is known of the nidification of many genera. The group will now consist of the Cuculidæ proper and the Turacoos, among which I am still doubtful whether *Opisthocomus cristatus* ought to be included or not, as I have never seen a skeleton, and, in the lithograph published by Castelnau, 'Expédition dans l'Amérique,' the femur crosses the anterior part of the ischium, so as to hide the process if it exists; in other respects, with the exception of the sternum, which is evidently distorted, the whole skeleton resembles the Turacoos. Nor have I yet seen the skeleton of *Indicator*, which has been usually classed with the Cuckoos.

L.—*On the Agency of Bees in the Fertilization of Papilionaceous Flowers, and on the Crossing of Kidney Beans.* By CHARLES DARWIN, F.R.S.*

IN a brief notice published by me on this subject last year, I stated that bees always alight on the left wing-petal of the Scarlet Kidney Bean, and in doing so depress it; and this acts on the tubular and spiral keel-petal, which causes the pistil to protrude: on the pistil there is a brush of hairs; and by the repeated movement of the keel-petal the hairs brush the pollen beyond the anthers on to the stigmatic surface. This complex contrivance led me to suppose that bees were necessary to the fertilization of the flower: accordingly I enclosed some few flowers in bottles and under gauze; and those which were not in any way moved did not set a single pod, whereas some of those which I moved in imitation of the bees produced fine pods. But I then stated that the experiment was tried on much too small a scale to be trusted. I have this year covered up between 3 and 4 feet in length of a row of Kidney Beans, just before the flowers opened, in a tall bag of very thin net. Nothing in the appearance of the plants would lead me to suppose that this was in any way injurious to their fertilization: and I think this conclusion may be trusted; for some of the flowers which I moved in the same way as the bees do, produced pods quite as fine as could be found in the uncovered rows.

The result was that the covered-up plants had produced by August 13th only thirty-five pods, and in no one case two pods on the same stalk, whereas the adjoining uncovered rows were crowded with clusters of pods. There were many flowers still on the plants when uncovered; and it was curious to see how, in a few days afterwards, as soon as the bees had access to them, a number of pods hanging in clusters of three and four together were produced. On August 17th I again put the net on a later crop. The covered plants now produced ninety-seven pods, borne on seventy-four stalks, showing that the same stalk often produced more than one pod. This time I kept an equal length of uncovered beans ungathered; and on this length there were 292 pods, or exactly thrice as many as on the covered plants. Taking this number as the standard of comparison for the first experiment (which, however, is hardly fair, as my gardener thinks the second crop was more productive than the first), more than eight times as many pods were produced on the uncovered than on the covered rows. The Kidney Bean is largely frequented by the *Thrips*; and as I have with some other plants actually seen a *Thrips* which was dusted with pollen leave several granules on the

* Extracted from the 'Gardeners' Chronicle' of November 13, 1858.

stigma, it is quite possible that the fertilization of the covered-up flowers might have been thus aided.

In the common Bean there is no such obvious relation between the structure of the flower and the visits of bees; yet, when these insects alight on the wing-petals, they cause the rectangularly bent pistil and the pollen to protrude through the slit in the keel-petal. I was led to try the effect of covering them up, from a statement in the 'Gardeners' Chronicle' made several years ago, viz. that when bees bite holes through the calyx of the flower in order to get more easily at the nectar, the crop is injured. This was attributed by the writer to injury of the ovarium, which I am sure is incorrect. But I thought that it was possible that the fertilization would be less perfect, as soon as bees ceased to alight on the wing-petals. I accordingly covered up seventeen plants, just before the flowers opened, moving a few flowers to ascertain that very fine pods, including the full average number of beans, could be, and were, produced on the plants under the net. These seventeen plants produced thirty-six pods; but no less than eight of them, though well formed, did not include a single bean. The thirty-six pods together contained only forty beans, and, if the empty pods be excluded, each produced on an average less than one and a half beans; on the other hand, seventeen uncovered plants in an adjoining row which were visited by the bees produced forty-five pods, all including beans, 135 in number, or on an average exactly three beans to each pod,—so that the uncovered beans were nearly thrice as fertile as the covered.

In an old number of the 'Gardeners' Chronicle' an extract is given from a New Zealand newspaper, in which much surprise is expressed that the introduced Clover never seeded freely until the hive-bee was introduced. This statement may be erroneous; at least, as I shall immediately show, it does not apply to the Canterbury Settlement. But I was induced by it to cover up under the same open sort of net about a yard square of the common White Clover, growing thickly in turf; and I then gathered an equal number of heads from the covered and from some uncovered plants which were growing all round, and which I had seen daily visited by my bees. I collected the seed into a small parcel; and, as far as I could estimate, the uncovered plants produced just ten times as much seed as the covered. Speaking loosely, the covered heads might have been said to have produced no seed.

Lathyrus grandiflorus is very rarely visited by bees in this country; and from experiments which I have tried during the last two summers, and from experiments recorded in 'Loudon's Magazine,' I am convinced that moving the flowers favours their

fertilization, even when the young pod falls off, as very often happens almost immediately. Sir W. Macarthur, who did not know of my experiments, told me that he had found that in New South Wales the introduced *Erythrina* did not set its pods well unless the flowers were moved. From the statement in regard to the Clover in New Zealand, I wrote to Mr. Swale, of Christchurch in New Zealand, and asked him whether Leguminous plants seeded there freely before the hive-bee was introduced; and he, in the most obliging manner, has sent me a list of twenty-four plants of this order which seeded abundantly before bees were introduced. And as he states that there is no indigenous bee (perhaps this statement applies to bees resembling hive or humble bees, for some other genera are known to inhabit New Zealand), the fact that these plants seeded freely at first appears quite fatal to my doctrine. But Mr. Swale adds that he believes that three species of a wasp-like insect performed the part of bees, before the introduction of the latter: unfortunately he does not expressly state that he has seen them sucking the flower. He further adds a remarkable statement, that there are two or three kinds of grasshoppers which frequent flowers; and he says he has repeatedly watched them "release the stamens from the keel-petal,"—so that, extraordinary as the fact is, it would appear that grasshoppers, though having a mouth so differently constructed, in New Zealand have to a certain extent the habits of bees. Mr. Swale further adds that the garden varieties of the Lupine seed less freely than any other leguminous plant in New Zealand; and he says, "I have for amusement during the summer released the stamens with a pin; and a pod of seed has always rewarded me for my trouble, and the adjoining flowers not so served have all proved blind." The case of the Lupine in New Zealand not seeding freely now that bees have been introduced may be accounted for by the fact, if I dare trust my memory, that in England this plant is visited by humble-bees, and not by hive-bees.

These several facts, and the foregoing experiments, seem to me rather curious; for who, seeing that papilionaceous flowers are hermaphrodite, have an abundant supply of pollen, which is mature before the flower opens, and that the flower itself is so neatly closed, would have imagined that insects played so important a part in their fertilization? I can hardly doubt that in England, during a season when bees were very scanty, if in any one district large crops of seed-clover were planted, the crop would partly fail, from the flowers not being sufficiently moved.

The foregoing little experiments, however, were not tried in relation to the agency of insects in fertilizing a plant with its own pollen. Andrew Knight many years ago propounded the

doctrine that no plant self-fertilizes itself for a perpetuity of generations. After pretty close investigation of the subject, I am strongly inclined to believe that this is a law of nature throughout the vegetable and animal kingdoms. I am well aware that there are several cases of difficulty.

The Leguminosæ with papilionaceous flowers have been advanced by Pallas and others as a case in which crossing could never naturally take place. But any plant habitually visited by insects in such a manner that their hairy bodies, to which pollen so readily adheres, come into contact with the stigma, could hardly fail occasionally to receive the pollen from another individual of the same species. In all Leguminosæ, bees do brush over the stigma. And the possibility of crossing would be very strong in the case of any plant, if the agency of insects were necessary for its self-fertilization; for it would show that it was habitually visited by them.

From these considerations I was led to believe that papilionaceous plants must be occasionally crossed. Nevertheless I must confess that, from such evidence as I have been able to acquire, crossing between varieties growing close together does not take place nearly so freely as I should have expected. As far as I am aware, only three or four cases of such crosses are on record. It is not by any means, I believe, a common practice with seed-raisers to keep the crops of their leguminous plants separate. Hence I was led last year, in my short communication to the 'Gardeners' Chronicle,' to ask whether any of your readers had any experience on the natural crossing of Beans, Peas, &c. Mr. Coe, of Knowle, near Fareham, Hants, in the most obliging manner sent me some specimens, and an account that last summer he had planted four rows of the Negro Dwarf Kidney Bean between some rows of the white and brown dwarfs, and likewise near some Scarlet Runners. The dwarfs he had saved for seed. The plants themselves he believes presented nothing remarkable in foliage, height, flowers, &c.; and he feels sure that their pods were all alike: but the beans themselves presented an extraordinary mixture, as I can testify from the sample sent me, of all shades between light brown and black, and a few mottled with white; not one-fifth of the beans, perhaps much less, were pure Negroes. Some few of the beans also in the rows of the white Haricot were affected, but none of the brown dwarfs.

Hence, then, we apparently have the extraordinary fact, described by Wiegmann in the case of several leguminous plants experimented on most carefully by Gärtner in the case of the Pea, and described a few years ago by Mr. Berkeley in the 'Gardeners' Chronicle,' of the pollen of one variety having affected not only the embryo but the tunics of the seed borne by the pure

mother. I have said that apparently we have here a fact of this nature; for I must state that Mr. Coe sent me a dozen of the pure Negro Beans which produced in 1857 the extraordinary mixture. I sowed them this year; and though quite like each other in appearance, the dozen produced plants differing in colour of flower, &c., and beans of various tints; so that these beans, though not affected in their outer tunics, seem to have been the product of a cross in the previous year of 1856.

This year I sowed the extraordinary mixture raised by Mr. Coe in 1857 from the four rows of the Negro Bean, which he believes to have been quite pure; and the produce is the most extraordinarily heterogeneous mixture which can be conceived—each plant differing from the others in tallness, foliage, colour, and size of flower, time of ripening and flowering, size, shape, and colour of pods, and beans of every conceivable tint from black to pale brown, some dark purple and some slightly mottled, and of various sizes and shapes. My gardener remarked, as did Mr. Coe with respect to some of his plants, that some of the seedlings seemed to have been crossed by the Scarlet Runner: one of my plants trailed on the ground for a length of 4 feet, its flowers were white, and its pods were very long, flat, and broad; the beans were pinkish purple, and twice as large as those of the Negro; there were also in two cases brown and purple beans in the same pod. These facts certainly seem to indicate a cross from the Scarlet Runner; but as the latter is generally esteemed a distinct species, I feel very doubtful on this head; and we should remember that it is well established that mongrels frequently, or even generally, are much more vigorous than either of their parents.

Mr. Coe tried the experiment more philosophically, and separated his heterogeneous Negro beans into twelve lots, according to their tints; and keeping a few of each as a sample, he sowed them, and he has now harvested them separately. He has kindly sent me samples of all. The variation is now much greater than it was in the parent lot of 1857. Beans of new colours have appeared, such as pure white, bright purple, yellow; and many are much mottled. Not one of the twelve lots has transmitted its own tint to all the beans produced by it; nevertheless the dark beans have clearly produced a greater number of dark, and the light-coloured beans a greater number of light colour. The mottling seems to have been strongly inherited, but always increased. To give one case of the greatest variability, a dirty-brown bean, nearly intermediate in tint between the darkest and lightest, produced a sample which I have been enabled to divide into no less than a dozen different tints, viz. pure white, black, purple, yellow, and eight other tints between brown, slate, yellow, purple,

or black. It has been stated that a few of the white Haricots in the rows adjoining the Negroes were in 1857 slightly affected. Mr. Coe sowed some which were of a very pale brown, or cream-coloured; and he has sent me a pod produced this autumn, which pod includes two beans of the above tint and one of a pale, dirty, purplish brown.

Now it may be asked, are we justified in attributing this extraordinary amount of variation to crossing, whether or not the crossing was all confined to the year 1857? or may not the case be one of simple variation? I think we must reject the latter alternative. For, in the first place, the Negro Bean is an old variety, and is reputed to be very true; in the second place, I do not believe any case is on record of a vast number of plants of the same variety all sporting at the very same period. On the other hand, the Negroes having been planted between rows of white and brown beans, together with the facts which I have given on the importance of insect agency in the fertilization of the Kidney Bean, showing, as may be daily seen, how incessantly the flowers are visited by bees, strongly favour the theory of crossing. Moreover, the extraordinary increase in variability in the second generation strikingly confirms this conclusion; for extreme variability in the offspring from mongrels has been observed by all who have attended to this subject.

As seed-raisers do not usually take any precautions in separating their crops of leguminous plants, it may be asked, how are we to account for the extraordinary amount of crossing in Mr. Coe's plants in 1857, when almost every plant in the four rows of the Negro seems to have been affected? I may here add that, in an old paper in the Journal of the Bath Agricultural Society, there is an almost exactly parallel account of the crossing of several varieties of the common Bean throughout a whole field. Insect agency is always at work: but the movement of the corolla will generally tend merely to push the flower's own pollen, which is mature as soon as the flower is open, on to the stigmatic surface; and even if pollen is brought by the bees from another flower, the chances are in favour of pollen from the same variety being brought, where a large stock is cultivated.

I can explain Mr. Coe's case, and that in the Bath Journal, only on one hypothesis, viz. that from some cause the Negro Beans did not, at Knowle, in 1857, produce good pollen, or they matured it later than usual. This has been shown by Gärtner sometimes to occur, and would explain, with the aid of insect agency, the whole case. Believing, as I do, that it is a law of nature that every organic being should occasionally be crossed with a distinct individual of the same species, and seeing that the structure of papilionaceous flowers causes the plant's own

pollen to be pushed on to its own stigma, I am inclined to speculate a little further. It is, I think, well ascertained that very close interbreeding tends to produce sterility, at least amongst animals. Moreover, in plants, it has been ascertained that the male organs fail in fertility more readily than the female organs, both from hybridity and from other causes, and further, that they resume their fertility slower, when a hybrid is crossed in successive generations with either pure parent, than do the female organs. May we not then suppose, in the case of leguminous plants, after a long course of self-fertilization, that the pollen begins to fail, and then, and not till then, the plants are eagerly ready to receive pollen from some other variety? Can this be connected with the apparently short duration and constant succession of new varieties amongst our Peas, and, as is stated to be the case on the Continent, with Kidney Beans?

These speculations may be valueless; but I venture earnestly to request any of your correspondents who may have noticed any analogous facts connected with sudden and large variation in their seed-crops of any leguminous plants (including Sweet Peas), or any facts bearing on such plants having kept true for many consecutive generations when grown near each other, to have the kindness to take the trouble to communicate them to the 'Gardeners' Chronicle,' or to the following address, C. Darwin, Downe, Bromley, Kent.

II.—Description of a new species of Bird from Palestine.

By PHILIP LUTLEY SCLATER, M.A., F.L.S.

Amydrus Tristramii.

Saturate purpureo-nitens, ventre obscuriore; alis caudaque obscure nigris viridi-nitente marginatis: alarum primariis omnibus clare ochraceo-fulvis, nigricanti-fusco late terminatis, extimo quoque eodem colore extus partim limbato: rostro et pedibus nigris. ♀ mari similis, sed paulo minor, obscurior, et præcipue in capite et gutture fusca.

Long. tota maris 11·0, alæ 5·9, caudæ 4·5, rostri a rictu 1·4, tarsi 1·25.

Hab. in Terra Sancta.

A pair of this fine species, which belongs to the brilliant group of *Lamprotornithinae*, or Glossy Starlings, was obtained by the Rev. H. B. Tristram in Palestine during the present spring, and I have called it after its discoverer. It forms a third of the small group to which Cabanis's term *Amydrus* is now restricted. It is rather larger than *Amydrus fulvipennis* (Sw.) of Western and Southern Africa; and the primaries are of a uniform pale buffy

fulvous, with the shafts black, instead of being lighter in the interior and edged with darker chestnut, as is the case in the latter species. From *Amydrus morio* of Abyssinia and Western Africa, the only other member of the group as now restricted, it is at once distinguishable by its smaller size and the paler colouring of the primaries.

Mr. Tristram shot these birds on the 30th of March last, at Mar-Saaba, in the valley of the Hebron. They had their nest in the rocks; but he was unable to reach it. The discovery is of much interest, as the bird belongs to a purely African group not hitherto met with in Palestine.

BIBLIOGRAPHICAL NOTICES.

General Report upon the Zoology of the several Pacific Railroad Routes. Part II. Birds. By SPENCER F. BAIRD, Assistant Secretary, Smithsonian Institution; with the co-operation of JOHN CASSIN and GEORGE N. LAWRENCE. 1 vol. 4to, Washington, 1858.

IN our notice of the first Part* of this important work, some account is given of the way in which the large mass of zoological *matériel* collected by the various expeditions sent out by the United States Government to investigate the most practicable railroad route from the Mississippi to the Pacific Ocean, was proposed to be treated. The second Part, which has just issued from the press, serves to confirm our opinion as to the excellence of the method chosen, and the great value of the results thus likely to be obtained. The present volume (in which Prof. Baird, the general editor, has been ably assisted by Messrs. Cassin and Lawrence) contains a systematic account of the birds collected or observed by the parties organized under the direction of the War Department for exploring the different railroad routes; and, as in the volume on Mammals, by the insertion of the comparatively few species not noticed by these expeditions, it has been made a complete exposition of the present state of our knowledge of the birds of America north of Mexico. For, besides the specimens collected by the railroad surveys, the Smithsonian Institution has become the depository of collections from several other sources, forming altogether a series of 12,000 specimens illustrative of the ornithology of North America; so that the materials for a general Report of this kind were ample. And it must be allowed, we think, that good use has been made of them. Even those who object to what they may term the new-fangled system of arrangement—the excessive subdivision of the genera and multiplication of species, and the unnecessary changes of old-established and familiar appellations—must admit that the divisions are generally well defined, the distinctive characters of the species, such as they

* *Vide* Ann. Nat. Hist. ser. 3. vol. i. p. 369.

are, clearly pointed out, and that, where changes in the names have been introduced, it is generally only in strict obedience to rules, the object of which is to establish uniformity of nomenclature.

We must also again call attention to the admirable plan pursued, of cataloguing *every specimen obtained*, and giving not only its exact locality, but its dimensions. It is only by drawing specific characters from such a series, instead of describing from isolated individuals, that the great error which the late Prince Bonaparte (who in this respect, it must be confessed, often practised what he preached against) used to denounce so emphatically as that of "*describing specimens instead of species*," can be avoided.

While thus according praise, we must not neglect to protest against the occasionally rather numerous misprints in the book, which are certainly more frequent than they ought to be, and against the careless way in which the scientific names are sometimes written; such as *Thriothorus* instead of *Thryothorus* (θύριον, *arundo*), *Lanivireo* instead of *Laniivireo* (a barbarous compound at the best), *Hylatomus* for *Hylotomus* (ὕλοτόμος), *Sphyrapicus* for *Sphyrapicus* (σφύρα et *picus*!), &c.

Prof. Baird's preface gives a brief sketch of the modern alterations in the arrangement of the non-rapacious land-birds, now very generally gaining ground, and which he himself adopts. From the list of authors mentioned as associated in this important reform, we must beg him to strike out the name of Reichenbach. In the 'Handbuch der Speciellen Ornithologie' of that laborious compiler, and the *miscalled* 'Avium Systema Naturale,' he will find little attention paid to Müller's great discoveries, but a complication of arrangement only to be compared to the dreams of the extinct Quinarians, or the fantasies of the author of the celebrated 'Entwickelungs-geschichte der Europäischen Thierwelt.'

Among the sixty-one North American Accipitres (which still retain their place at the head of the present arrangement), it can only be a strong feeling of patriotism that induces Mr. Cassin to retain in his list Audubon's *Falco Washingtonii*. This bird would, we suspect, have been long ago cast out by American ornithologists, were it not for its name. No one now believes in certain birds described by the great Le Vaillant as observed by himself in Africa; and the time is come when the existence of Washington's Eagle, as seen by the great Audubon in Kentucky, must be considered as equally mythical.

The *Scansores*, which take the next place, include thirty-five species, principally made up of Woodpeckers, which find a congenial habitation in what may be truly called "the continent of forests." But however much Prof. Baird may wish to add the magnificent *Campephilus imperialis* to the list of truly North American species, we suspect he will have to wait some time before he accomplishes it. There is good reason to believe that its true *habitat* is Guatemala—the country of the Long-tailed Trogon and Derbian *Oreophasis*—and that it probably does not occur even so far north as Mexico. A good deal of "annexation" must therefore take place before the imperial bird is brought within the limits of the great Republic.

The third order (*Insessores*), embracing 332 species—nearly half the whole number of North American birds known—is divided by Prof. Baird (à la Cabanis) into *Strisores*, *Clamatores*, and *Oscines*. The Humming-birds occurring within the area of the States, as now extended, are seven in number, the Swifts are four, and the Goat-suckers six, making seventeen members of the first of these groups. The second contains two Kingfishers, a stray Motmot, detected near the borders of Texas, in the State of New Leon, by the indefatigable collector Couch, and is made up of the many members of the difficult group *Colopteridæ*. Of the remaining section of *Oscines* North America has representatives of all the families that are known to occur in the New World,—a *Certhiola*, of the family *Cœrebidæ*, the only one hitherto supposed absent, having been detected on the Florida Keys in time for the insertion of its occurrence in the Appendix.

The fourth order (*Rasores*) includes the Pigeons, with eleven species, and the *Gallinæ*, with twenty-one. Among the latter occurs one member of the Neotropical family of Guans (*Penelopidæ*), and two species of the genus *Meleagris*, the sole representative of the *Phasianidæ* in the New World. The lately established *Meleagris mexicana* of Mr. Gould is admitted as a probably good species. Eighty-four *Grallæ* and 175 *Natatores* make up the total of 716 birds considered as properly belonging to this fauna, being an increase of 210 since the last general enumeration given by Audubon in 1838. Of these, however, a certain number, such as *Haliaëtus Washingtonii* (which we have already alluded to), *Chrysomitris Yarrellii*, and *C. magellanica*, both purely South American species, and a few others, might, we think, be advantageously removed to an "*Appendix specierum dubiarum*."

A Life of Linnæus. By Miss BRIGHTWELL, of Norwich.
London, Van Voorst, 1858. 16mo.

IN this little biography of Linnæus, intended principally for the perusal of the rising generation, Miss Brightwell has portrayed in lively colours the principal scenes in the life of the great Swedish Naturalist. His early struggles, his ultimate success, his progress to a world-wide renown, and to the highest honours his country could bestow, are faithfully described; and Miss Brightwell has skilfully placed these in such a light as to show how much of human interest attaches to the life even of a laborious naturalist.

It is indeed from the fact that the latter term is strictly applicable to Linnæus throughout the whole of his career—alike when at Upsal he was under the necessity of patching his own shoes with paper, as when, arrived at the height of his reputation, he was graciously permitted to smoke his pipe even under the queen's own nose—that Miss Brightwell derives the moral of her tale, pointing out that, great as might have been the native genius of the illustrious Swede, it was not by this alone, but by the most patient and unremitting

labour that he was enabled to immortalize his name. At no period, perhaps, has the recognition of this truth been more necessary than at present, when a superficial acquaintance with a host of sciences is looked upon as knowledge,—when a lively booby or pompous humbug has far more chance of making himself a profitable name, however short-lived, than the most earnest labourer in one department of science, and the younger members of the community are thus likely to be led away to swell the ranks of those who must be regarded as mere cumberers of the ground.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

April 27, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

NOTE ON THE EGG OF "THE MOORUK" (CASUARIUS BENNETTI, GOULD), FROM NEW BRITAIN, IN THE BRITISH MUSEUM. BY DR. J. E. GRAY, F.R.S., ETC.

The British Museum having obtained from Mr. Samuel Stevens the egg of the *Mooruk* from New Britain (sent to him by Mr. Turner, which he wished to exhibit to the Society before he delivered it into the Collection), I am induced to send the following observations on it.

The egg is of the same form and has the same solid shell, covered with rounded tubercles, as that of the Common Cassowary, *Casuarus galeatus*.

It differs from the egg of the latter bird in the British Museum in being rather larger (it is $14\frac{1}{4}$ inches in circumference in the longest, and $11\frac{1}{2}$ inches in the thickest part), and in the tubercles on the surface being larger, considerably further apart, and more isolated, that is to say, more rarely confluent together.

The egg is pale olive-green with darker olive tubercles; it is much darker than accords with my recollections of the eggs of the Cassowaries in other collections; but these may have been faded, as is the case with our specimens in the British Museum.

Mr. Bennett sent with the living specimen of the *Mooruk* now exhibited in the Menagerie, which he so liberally presented to the Society, an egg which was brought from New Britain with the bird. This egg has been presented by him, through the Society, to the British Museum.

This egg differs very considerably from that exhibited by Mr. Stevens: first, in being smaller, that is to say, only $13\frac{1}{2}$ inches in circumference in the longest and 11 inches in the thickest part; secondly, in being blunter, more rounded in front, and not so conical as the other; thirdly, in being of a uniform pale olive-colour, without any appearance of tubercles or darker spots.

It has been suggested that the difference between the two eggs is so great that they cannot have been laid by the same species of bird.

They both differ considerably from the egg of the Galeated Cassowary; and Mrs. Turner assures me that they were both brought from New Britain, by her husband and the captain of the ship, with the living bird, to Sydney; they were divided by lot, and her husband having the choice, selected the tuberculated egg: so that, if they are not the eggs of the Mooruk, it would indicate that there must be two Cassowaries inhabiting New Britain, both different from *C. galeatus*.

There is so great a similarity in the colour and texture of the smooth egg with the ground-colour of the other egg between the tubercles, that it has been suggested that the tuberculated egg is the perfect egg of the bird, and the smooth egg that of a very immature or sickly specimen.

June 8, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

ON NEW SPECIES OF BIRDS FROM WESTERN AFRICA, IN THE COLLECTION OF THE BRITISH MUSEUM. BY DR. GUSTAV HARTLAUB OF BREMEN, FOREIGN MEMBER.

One of the principal reasons that made me anxious to visit England was the wish to increase my materials for a second edition of my book on the Birds of Western Africa. In this object I have been most liberally assisted by Mr. G. R. Gray, who has allowed me every opportunity of examining the specimens in the magnificent Collection of the British Museum. Besides some interesting novelties which we found, and which I wish to describe in the 'Proceedings' of the Society, among whose Foreign Members I have the honour to be enrolled, I have had the pleasure of inspecting some very rare species which I had not seen before. Among these I may mention some of those rare types collected during the second Niger Expedition by Mr. Louis Fraser,—as, for instance, the *Sylvicola superciliosa* of that naturalist, which, from a second and more perfect Ashantee specimen, I have found to be what I never expected, a typical *Camaroptera*; then the *Coccothraustes olivaceus* of Fraser, a type most peculiar and unique amongst the great number of African Fringillidæ. But by far the most interesting and most curious African form, which I have seen for the first time, is a little bird hardly larger than the smallest Humming-bird, the *Dicaeum Rushiæ* of Cassin, and the type of my genus *Pholidornis*. This minute and very peculiarly coloured species is the only true African representative of the essentially Asiatic form *Dicaeum*, from which, however, I hold it to be truly generically distinct.

The new species which I have observed are the following:—

1. *ONYCHOGNATHUS HARTLAUBII*, G. R. Gray, MS.

Minor; obscure violascenti-chalybeus; capite toto et remigum minorum marginibus externis in æneum vergentibus; scapularibus, tetricibus alarum minoribus et subalaribus dorso concoloribus; rectricibus obscure chalybeis, margine ænescentibus; remigum

nigrorum dimidio basali oblique rufo ; rostro nigro ; pedibus fuscis. ♀, *capite et collo cinerascente striatis.*

Long. tot. $10\frac{1}{2}$ " , rostr. a fr. 12" , al. $4\frac{1}{2}$ " , rectric. intermed. $4\frac{1}{4}$ " , tars. 11" .

Hab. Fernando Po.

This bird is a second and very typical species of my genus *Onychognathus*, the type of which, *O. fulgidus*, seems to be confined to the Island of St. Thomas. The system of colouring is quite the same in both species; but *O. Hartlaubii* is a much smaller bird, and has the bill much less hooked. One of the two specimens in the British Museum is labeled "Fernando Po;" the exact habitat of the other one is not known. *Onychognathus* is a beautiful transitional form, intermediate between *Amydrus* and *Lamprocolius*.

2. TELEPHONUS MINUTUS.

Minor ; pileo toto nigro ; striola superciliari gracili albida ; cervice et interscapulio immaculate fulvis ; dorso medio longitudinaliter nigro variegato ; tergo et uropygio fulvis ; loris albidis ; alis rufis, remigibus primariis in pogonio interno nigrisanti-fuscis, tertiariis et tectricibus majoribus in medio longitudinaliter nigricantibus ; subalaribus fulvis ; rectricibus fusco-nigris, duabus externis fulvescente extus limbatis, extimæ apice latius pallido ; corpore inferiore toto fulvo, gula pallidiore ; rostro valido nigro ; pedibus fuscis.

Long. 7" , rostr. a fr. $8\frac{1}{2}$ " , al. 2" 7" , caud. 3" , tars. $11\frac{1}{2}$ " .

Hab. Ashantee.

This is the smallest species of the exclusively African genus *Telephonus*. It is, perhaps, not generally known in this country, that the German traveller, Dr. A. Brehm, a very acute and scientific naturalist, who has explored the Ornithology of Spain better than any person before him, most decidedly contradicts the occurrence of *Telephonus cucullatus* or of any other species of this group in that country. Temminck's indication to the contrary appears to be one of those many errors occurring in Parts 3 and 4 of the 'Manuel d'Ornithologie;' at least it was regarded as such by every person in Spain who had paid any attention to the birds of the country, and Dr. Brehm himself could not discover there the slightest trace of this bird.

Another striking and interesting example of the *incorrectness* of local indications in the 'Manuel d'Ornithologie,' is given in the total absence of the *Ixos obscurus* from Spain or any other country in the south of Europe.

Two specimens of *T. minutus* are in the collection of the British Museum, which likewise possesses a very complete set of all the other known species of the genus.

3. ANDROPADUS ERYTHROPTERUS, G. R. Gray, MS.

Obscure olivaceus, alis totis et imprimis tectricibus distincte rufescentibus ; remigum marginibus internis pallidis ; subalaribus fla-

vidis; cauda fusca; corpore inferiore pallidiore, flavescente; rostro fusco, apice et mandibula tota flavidis; pedibus pallidis.

Long. tot. 6", rostr. $5\frac{1}{2}$ ", al. 2" 8", caud. 2" 9", tars. 8".

Hab. Ashantee.

Another bird of one of those exclusively African genera which seem to have their full development on the western coast. The other species are, *A. importunus* from the Cape, *A. latirostris* and *A. gracilirostris*, both widely distributed along the western coast, and *A. virens* of Cassin, discovered by Du Chaillu on the banks of the river Muni and near Cape Lopez. The colouring of all these species is very much alike; and clearer distinctive characters are much wanted in this group.

4. TRICHOPHORUS CINERASCENS.

Supra olivaceo-viridis, plumis medio cinerascantibus, capite distinctius cinerascante; genarum plumulis stria mediana pallida notatis; tergo et uropygio viridioribus; remigum pogoniis externis virentibus, internis nigrificantibus; rectricibus olivaceis, scapis nigris; subalaribus et subcaudalibus olivaceis: subtus olivaceo et cinerascante variegatus; gula flava; rostro plumbeo; pedibus nigrificantibus.

Long. tot. $8\frac{1}{2}$ ", rostr. 9", al. 4", caud. 4", tars. $10\frac{1}{2}$ ".

Hab. Ashantee.

This fine new species comes nearest to *Tr. flavicollis* of Swainson, but is easily distinguished by the much greater amount of grey in its colouring. Nearly the whole of this group is distributed over the western parts of Africa. We know only one southern species. Not one has as yet been discovered in Abyssinia.

ON TWO NEW SPECIES OF TANAGERS FROM THE COLLECTION OF M. VERREAUX OF PARIS. BY PHILIP LUTLEY SCLATER.

CHLOROSPINGUS CASTANEICOLLIS.

Supra olivascenti-fuscus, pileo saturatiore, alis caudaque rufescentioribus: capitis lateribus cum mento nigris, superciliis angustis ad nucham protractis et macula parva suboculari albis: subtus castaneus, pectore saturatiore, ventre medio dilutiore: rostro nigro: pedibus brunneis.

Long. tota 5.4, alæ 2.5, caudæ 2.3.

In colour this apparently new species of *Chlorospingus* shows most resemblance to *C. melanotis* (P. Z. S. 1854, pl. 68), and it may be conveniently arranged next to that species, and between it and *C. rubrirostris*, with which it nearly agrees in the shape of the bill. The dark chestnut colour of the breast, black chin, and white-superciliary stripe render it easily recognizable amongst its congeners.

CALLISTE CYANOTIS.

Metallice viridis, dorso summo obscuriore, pileo supero nigro; superciliis latis metallice viridibus: fronte ipsa cum loris nigris:

regione auriculari et vitta supra-frontali cærulescentibus; alis caudaque nigris cærulescenti-viridi limbatis: ventre imo crissoque pallide ochraceis: rostro nigro, pedibus brunneis.

Long. tota 3·8, alæ 2·5, caudæ 1·7.

Obs. Affinis *CALLISTÆ LABRADORIDI*, sed crassitie paulo minore, vitta frontali et regione auriculari cæruleis et colore corporis viridi minus cærulescente distinguenda.

Having recently completed a Monograph of the genus *Calliste*, it is with no ordinary interest that I look upon the present bird, which seems to be a new and hitherto unrecognized member of the group. A close ally of *Calliste labradorides* of the New Granadian Andes, it doubtless represents that species in South-eastern Peru and Bolivia, just as *Calliste xanthocephala* replaces *Calliste venusta* in the same locality. The single specimen sent by M. Verreaux is not in very perfect plumage; but its distinctness from its New Granadian representative is easily seen on comparison. The whole of the fore part of the head of *C. labradorides* is of a shining green, leaving the nape and back of the neck black. In the present bird there is merely a narrow post-frontal band, which, like the ear-coverts, is deeply tinged with blue. The black chin of *C. labradorides* appears to be absent in the present bird; and the under surface is not tinged with blue. In *C. labradorides* the small coverts on the bend of the wing are of a bright shining blue, which is also absent in this new species.

A MONOGRAPH OF THE GENUS *KERIVOULA*.

BY ROBERT F. TOMES.

The following monograph is one of a series which I have prepared, having for their object the definition of groups or genera rather than the description of the species of which they are composed. This has been done with a view to render less difficult the determination of the species, which difficulty is chiefly felt from the indiscriminate manner in which they are thrown together by some zoologists; the descriptions of the species themselves being often quite sufficient, supposing that they had been more carefully divided into groups.

Two principal works which demand study in working out the species of *Vespertilionidæ*—Temminck's Monograph, and Wagner's Supplement to the work of Schreber—are of this description. Whilst giving a pretty complete account of each species, the generic definition is, in consequence of the great disparity in the characters of the different species, necessarily so vague as to be nearly useless.

Scarcely more valuable to the investigator are lists of genera and species without accompanying descriptions, or having these so excessively brief as to be wholly unavailable in distinguishing species.

I have therefore, while bringing together species which fall easily under a generic definition, considered it advisable to add also a description of each, although they may have been before described, or be even well-known species.

By adopting this method I am enabled to give much more complete descriptions than have hitherto appeared, because they are of

a more comparative nature, and are therefore more serviceable in the discrimination of allied species.

With regard to the synonymy of the several groups, it is as complete as I have been able to make it, but is I believe very imperfect. In all instances care has been taken to exclude such names and references as I could not either personally test by the examination of unquestionable species, or by the comparison of figures and descriptions agreeing with such accuracy as to leave no reasonable doubt as to their identity.

This explanation appeared necessary previous to bringing before the Society successive papers in which but very few of the species are new, and many old and well-known ones are described at some length.

The name of *Kerivoula* was first given by Boddaert* to a species of Bat which had before been described by Pallas† by the name of *Vespertilio pictus*—a name singularly appropriate for an animal with the bright red fur and membranes, and the peculiar distribution of the colour on the latter, which characterizes the species.

Boddaert's specific name having given way to that of Pallas, has been taken up by Dr. Gray‡, and used in a generic sense, he having perceived that the species differed considerably from most other representatives of the genus *Vespertilio*. But Dr. Gray, placing great reliance on the importance of a single character, has arranged with it some species, the affinity of which the subsequent examination of a greater number of species has not corroborated. In these investigations others have been discovered which bear very close generic resemblance to the original one, *V. pictus*, whilst some of those which have been associated with it prove, on the contrary, to be by no means closely affined.

I have in a previous communication removed one of these species—*V. formosus*—from the present genus, and placed it in the group with the members of which its characters most closely agree. After describing the species which I consider referable to the genus *Kerivoula*, I shall enumerate such others as have been called by that name, but which I consider as appertaining to other groups.

Fam. VESPERTILIONIDÆ.

Genus KERIVOULA, Gray.

Vespertilio, Pallas, Geoffroy, Desmarest, Fischer, Schreber, Wagner, Temminck.

The top of the head is very much elevated, but not so much so as in *Furipterus*, *Natalus*, and *Miniopterus*. The face is depressed; and the muzzle is of moderate length, and somewhat pointed. The nostrils, which are near together, open sublaterally, and have an emarginate space between them. The lower lip has a tolerably well

* Elenchus Animalium, vol. i. sist. Quadrup. p. 70, No. 10, 1785.

† Spicilegia Zoologica, iii. p. 7, 1774.

‡ Annals and Mag. Nat. Hist. 1842, p. 258.

defined naked triangular space in front. The ears are broad, with the outer margin so much developed near the base as to form a complete *lobulus*, which however is not separated from the upright part of the ear by a notch or hollow, as in some species. The ear may, indeed, be described as extending along the side of the face for some distance, and in a line with the corner of the mouth, not as a narrow strip of membrane, as in the generality of species, but ascending at once from its most anterior point, and forming what is called the ear-conch. Its inner margin is very convex, and curves off to the tip of the ear, which terminates in an angular point not very acute. In all the species there is a notch or hollow of more or less extent in the outer margin, *very near to the tip*.

The ear bears great resemblance to those of *Furipterus* and *Natalus*, especially to those of the latter. The tragus is long, nearly three-fourths the length of the ear, *excessively narrow and pointed*, and a little curved outwards. Its outer margin near the base is furnished with a projecting point or tooth.

The tail is rather long, in some species as long as the head and body. The wing-membranes extend to the base of the toes. The feet are of medium size; and the toes occupy a little more than half the length of the foot. The thumb also is moderate; and the basal phalange, which is enclosed in the membrane, is shorter than the remaining part.

The membranes and ears of all the species are more or less diaphanous, and rather conspicuously marked with glandular dots arranged, on the former, in lines.

The fur is of a fine woolly texture, in the Asiatic species without lustre; but in the African ones the hairs have shining tips.

The skull does not, as might have been expected, exhibit any of those peculiarities which are observable in the high-crowned genera, such as *Furipterus*, *Natalus*, and *Miniopterus*. In its general appearance it somewhat resembles those of *Vesp. mystacinus* and *Vesp. Nattereri*, but the central region is much more inflated—indeed in the African species almost as much so as in *Furipterus*. Besides this point of difference, the following peculiarities require mention. The facial region is very much depressed, and also compressed; and the notch in the fore part of the palate is much deeper than in any other genus, but varies considerably in the different species. This appears to be due chiefly to the straightness of the intermaxillary bones, their development in a forward direction affording space for the incisors to range in a line with the other teeth, instead of being placed more or less across the opening between the two canines. This is best seen in the *K. picta*.

The bony palate extends nearly as far back as to the condyloid fossa, and narrows considerably after leaving the posterior boundary of the molar range. In no other Bat which I have examined has the palate extended further back than to the middle of the zygomatic arch.

Dentition.—In. $\frac{2-2}{6}$; Can. $\frac{1-1}{1-1}$; Premol. $\frac{3-3}{3-3}$; Mol. $\frac{3-3}{3-3} = \frac{18}{20}$.

The upper incisors are slender, conical, and pointed, with a slight

accessory cusp behind the base ; the anterior ones are the longer. The canines are long and pointed ; and in most of the species the *cingulum* is amply developed. Between them and the incisors the interval is very small. The next two teeth are very simple in form, conical, and pointed. Following these is the *carnassier* or sectorial tooth, in form as in the ordinary *Vespertilionidæ* ; and the molars are of the ordinary form and proportions.

In the lower jaw the incisors are small and trilobed, those contiguous to the canines having their central lobe *very much developed, and of a blunt conical form*. The canines require no particular notice. Following these, the premolars present the appearance of three very regular and pointed cones, each with a small but distinct spur on its anterior and posterior surface near to the base. The molars are of the form so constant in the *Vespertilionidæ*.

1. KERIVOULA PICTA.

Vespertilio pictus, Pallas, Spicil. Zool. iii. p. 7, 1774 ; Erxl. Syst. p. 150, 1777 ; Linn. Syst. Nat. ed. Gmel. i. p. 49, 1788 ; Geoff. Ann. du Mus. viii. p. 199, pl. 48 (cranium), 1806 ; Desm. Mam. p. 141, 1820 ; Schreb. Säugth. Th. i. p. 170, 1826 ; Horsf. Zool. Research. Java, viii. p. 6, 1821–28 ; Fisch. Synop. Mamm. p. 106, 1829 ; Temm. Mon. ii. p. 223, pl. 56. f. 1, 2, 3, 1835–41 ; Blasius, Wieg. Archiv, Bd. vi. p. 2, 1840 ; Wagn. Supp. Schreb. i. p. 517, 1840 ; Schinz, Synops. Mamm. p. 174, 1844 ; Kelaart, Faun. Zeylan. p. 25, 1852.

Vespertilio (Kerivoula) pictus, Horsf. Cat. Mamm. Mus. E. Ind. Comp. p. 40, 1851.

Pipistrellus pictus, Less. Nouv. Tab. Règne Anim. p. 29, 1842.

Kerivoula picta, Gray, Ann. and Mag. N. H. p. 258, 1842 ; Cat. Mamm. B. M. p. 27, 1843 ; Kelaart, Faun. Zeylan. p. 25, 1852.

Although I have given to this species the most prominent position, I do not regard it as the most typical of the genus ; but the generic name having been borrowed from it, it appeared desirable to mention it first, and those afterwards which are less known, but perhaps more characteristic.

The top of the head is very much elevated, but not quite so much so as in some of the other species of *Kerivoula* ; and the muzzle is a good deal depressed, and of medium length.

All the face is very hairy, the fur of the forehead extending nearly to the end of the nose, and filling up the concavity of the face. The upper lips are furnished with fine longish hairs of the same texture as those of the rest of the body.

The ears, as already mentioned in the generic description, are broad, and when seen in front appear like two rather broad recesses, in the further end or bottom of which the tragus takes its origin. They are rather more pointed than in some others, owing to a shallow notch immediately below their tip, in the outer margin ; and the inner margin becoming more convex as it approaches the tip, assists in giving to the latter an outward direction.

The tragus has been already described sufficiently.

The wing-membranes extend precisely to the base of the toes.

The tail is as long as the head and body, is composed of six joints, and has its tip enclosed in the membrane.

The fur of the back extends sparingly on to the interfemoral membrane, for half its length; and all its transverse lines are studded with very short and fine hairs, scarcely visible without the assistance of a lens. The upper surface of the tail itself, and of the legs and feet, is sparingly, but visibly, clothed with fine hairs, which are most conspicuous on the latter. The whole of the margin of the interfemoral membrane, inclusive of the *os calcis*, is fringed with fine hairs, those on the *os calcis* being adpressed and similar to those of the feet, whilst those on the edge of the membrane are projecting and bristle-like.

On no other part of the membranes does the fur of the body encroach; but that of the head extends for half the length of the ears, on their hinder surface.

The fur of the body is very fine, but without gloss, and nearly unicoloured. That of the upper parts is buff for two-thirds of its length, the remainder a bright and lively rust-colour. Beneath, it is uniform whitish buff, tinged with rust-colour on the humeral region and along the sides of the body.

All the bones of the limbs in the dried specimens are of a light yellowish-brown; and the interfemoral and interbrachial membranes are of the same colour. A part of the wing-membranes contiguous to the sides of the body, from the foot to the elbow, and from thence along the under side of the fore-arm to the wrist, is of a similar colour; and it passes from the wrist along each finger, margining it on each side, and leaving three triangular interspaces between the digits, of a deep chocolate-brown colour, which in many places is elaborately marked with dotted lines of the same light colour as that which accompanies the wing-bones.

The above description having been taken from dried specimens, I copy the following description of the colour of this species from the excellent account given of it by Dr. Kelaart in his 'Fauna Zeylanica':—

"Body above, yellowish ferruginous-brown, or, as artists would call it, yellowish crimson-brown. Below, fulvous whitish, with a dark yellowish tinge on the sides. Alar membranes black and bright yellow or citron-coloured. The former colour (black) confined to triangular spaces between the citron rays along the digits, and on a large triangular space between the last digit and body; the alar membrane adjoining the latter being also citron-coloured. Interfemoral membrane wholly citron-coloured; above and below the arms also, the same yellow colour prevails, as through the other parts of the membrane already mentioned." "Tips of toes brown, the rest yellow." "Ears yellow." "Sexes alike in colour."

As Dr. Kelaart is speaking of the species in its native country, and from personal observation when in a fresh state, the foregoing account is doubtless the correct one, and the comparatively dull colour which pervades all the specimens in our Museums is due to a change having taken place after preservation.

The following dimensions are taken, (1) from a Javanese specimen very kindly given to me by Dr. Horsfield, (2) from a specimen

from Amboyna, and (3) from the specimen mentioned in Mr. Waterhouse's Catalogue of the Mammalia contained in the Museum of the Zoological Society, No. 138.

	1.		2.		3.	
Length of the head and body, about ..	" 1	" 9	" 1	" 9	" 1	" 10
— of the tail	1	6	1	6	1	9
— of the head	0	7	0	7½	0	7½
— of the ears	0	6	0	5	0	5
Breadth of the ears	0	5	0	5	0	5
Length of the tragus	0	3½	0	3	0	3
— of the fore-arm	1	4	1	3½	1	4
— of the longest finger	2	11	2	10	3	0
— of the fourth finger	2	0	1	11½	2	1
— of the thumb	0	3	0	3	0	3
— of the tibia	0	7	0	7	0	7½
— of the foot and claws	0	4	0	3½	0	3½
— of the <i>os calcis</i>	0	6½	0	6	0	6½
Expanse of wings	10	6	10	0	11	0

Hab. The Continent of India ; Ceylon ; Java ; Sumatra ; Borneo.

2. KERIVOULA PAPILLOSA.

Vespertilio papillosus, Temm. Mon. de Mamm. ii. p. 220, 1835–41 ; Wagn. Supp. Schreb. Säugth. i. p. 515, 1840 ; Schinz, Synops. Mamm. i. p. 173, 1844 ; Blasius, Wieg. Archiv, Bd. vi. p. 2, 1840 ; Gray, Zool. Voy. Samar. no. 5. p. 10, 1849.

The present species, although not placed first on the list, is, I believe, quite as typical of the genus as the one preceding it. The top of the head is quite as much elevated as in that species ; and the face is similarly depressed, and densely hairy ; the nostrils, too, present precisely the same form and position. The ears are somewhat longer in relation to their breadth and to the size of the animal than in *K. picta*, and have their points less acute and directed upwards, instead of outwards as they are in that species. They are thickly and conspicuously dotted with glandular dots. The tragus is fully two-thirds of the length of the ear, is narrow, and tapers evenly to a very acute point. It has a very slight outward curvature for its whole length, and has a projecting point on its outer edge, close to its base.

The body of the animal is small, and all the membranes very much developed, nearly as much so as in *Natalus*.

The thumb is rather long, and the basal phalange less than half its entire length ; the feet are rather large, with the toes taking up half of their length, and the outer one a little shorter than the others, as it is also in *K. picta* and *K. Hardwickii*. The wing-membranes extend exactly to the base of the toes ; and the *os calcis* is two-thirds of the length from the foot to the end of the tail.

The hair of the face presents some differences from that of the last species. In *K. picta* that which borders and fringes the lips is of the same peculiar soft and woolly texture as the rest of the fur of the head and face ; that of *K. papillosa*, on the contrary, is strong

and bristle-like. Over the eyes is a tuft which is nearly four lines in length, and is very straight; and above the nostrils is a similar fringe of straight strong hairs, whilst the upper lips are margined similarly with hairs which have a downward curvature and almost conceal the mouth when it is closed.

The upper surfaces of the ears are hairy only near the base; and the fur of the upper parts of the body does not encroach noticeably upon the wing-membranes; but the base of the interfemoral membrane is a little hairy, and fine short hairs are scattered along the upper surfaces of the tail, tibia, and feet. The free portion of the edge of the interfemoral membrane, between the *os calcis* and end of the tail, is also slightly fringed with fine short hairs.

The fur is fine and woolly in texture, and very long; that of an example in the Museum of the East India Company, from Calcutta, attains as great a length as four lines on the dorsal region. It is bicoloured both above and beneath. On the whole of the upper parts it is dusky at the base for nearly two-thirds of its length, with the terminal third brown (nearly of the same tint as the back fur of *Vesp. Daubentonii*, but a little more tinged with rufous). Beneath, it is dusky at its base, tipped with yellowish-brown. Such is the colour of the specimen alluded to, presented to the Company's Museum by Mr. Pearson. A specimen in my own collection, taken in Ceylon by Mr. Thwaites, appears to exhibit the usual differences which exist between the animals of that island and the mainland of India. It is smaller and darker in colour, but is otherwise similar to the Calcutta specimen. The membranes are of a medium brown colour, darker in the Ceylon specimen.

Dentition.—In. $\frac{2-2}{6}$; Can. $\frac{1-1}{1-1}$; Premol. $\frac{3-3}{3-3}$; Mol. $\frac{3-3}{3-3} = \frac{18}{20}$.

I can detect no difference in the position or proportions of the teeth in this species from those of *K. picta*.

No. 1 of the following Table refers to the specimen from Calcutta, and No. 2 to the one from Ceylon.

	1.		2.	
	"	"	"	"
Length of the head and body .....	.....	.....	1	9
—— of the tail	2	0	1	9
—— of the head .....	.....	.....	0	$7\frac{1}{2}$
—— of the ears .....	.....	.....	0	$4\frac{1}{2}$
—— of the tragus .....	.....	.....	0	$3\frac{1}{2}$
—— of the fore-arm	1	$6\frac{1}{4}$	1	4
—— of the longest finger	2	5	1	10
—— of the fourth finger	2	3	1	11
—— of the thumb .....	.....	.....	0	$3\frac{1}{2}$
—— of the tibia	0	$9\frac{1}{2}$	0	8
—— of the foot and claws	0	4	0	4
—— of the <i>os calcis</i> .....	.....	.....	0	6
Expanse of wings .....	.....	.....	10	0

Hab. India; Ceylon; Java, and Sumatra.

3. KERIVOULA HARDWICKII.

Vespertilio Hardwickii, Horsf. Zool. Research. Java, no. 8, 1821–28; Cat. Mamm. E. Ind. Comp. Mus. p. 39, 1851; Temm. Mon. ii. p. 222, 1835–41; Wagn. Supp. Schreb. Säugth. i. p. 516, 1840; Blasius, Wieg. Archiv, Bd. vi. p. 2, 1840; Schinz, Synops. Mamm. i. p. 173, 1844.

Kerivoula Hardwickii, Gray, Ann. & Mag. N. H. x. p. 258, 1842; Cat. Mamm. B. M. p. 27, 1843; Zool. Voy. Samar. no. 5. p. 7, 1849.

Vespertilio pellucidus, Waterh. Proc. Zool. Soc. pt. xiii. pp. 3 & 6, 1845.

Vespertilio? pellucidus, Gray, Zool. Voy. Samar. no. 5. p. 7, 1849.

The following description has been taken from the original specimens in the Museum of the East India Company and in the British Museum, and from the one which furnished the description of *V. pellucidus* of Mr. Waterhouse, now also in the National Collection.

The examination and comparison of these has proved beyond question the identity of the latter species with *K. Hardwickii*. As the Javanese specimens are preserved in skin, and the one from the Philippines in spirit, they may be supposed, taken together, to furnish a tolerably accurate description of the species.

The elevated form of the head, the concavity of the face, and the shape of the muzzle and nostrils are so much like the same parts in *K. picta* and *K. papillosa*, as to require no further mention. The ears, although in general form very similar to those of the former of these species, differ in being a little longer, and in having their tips less acute and not so much directed outwards; in fact, they very closely resemble those of *K. papillosa*, and, as in that species, are thickly studded with glandular dots. The tragus is nearly two-thirds of the length of the ear, is narrow, excessively acute, and curved outwards in the dried specimens, but perfectly straight in the one in spirit.

The wing-membranes extend a little further than the base of the toes, almost to the middle of the outer one, which however is shorter than the others, and consequently the membrane does not reach as far as to the middle of the other toes, which may be said to constitute the foot. These remaining toes are of equal length, and are about half the entire length of the foot, which is rather large in relation to the size of the animal. The *os calcis* is long, and occupies two-thirds of the distance between the foot and end of the tail. The interfemoral membrane has about 18 or 19 transverse dotted lines.

The fur of the upper part of the body extends over the wing-membranes for a little distance, and over the interfemoral membrane in a similar manner. Beneath, the fur encroaches on the membrane similarly, but in a less degree. The upper surfaces of the tibiæ are fringed with fine bristly hairs; and the dots on the interfemoral membrane have each a bunch of very fine short bristles on the upper

surfaces, and the glandular dots of the ears are similarly provided on their hinder surfaces. The free portion of the interfemoral membrane, between the *os calcis* and tail, is also fringed with fine short hairs.

The fur is long, very fine and woolly; that of the upper parts of the body is grey at the base, which is succeeded by pale brown, and tipped with a slightly darker tint of the same colour. These shades are not sufficiently distinct to give a tricoloured appearance to the fur, the general appearance of which is buffy-brown. This is the colour of the type-specimen, which has probably faded considerably. That of the specimen in spirit appears (as far as can be seen in spirit) to be of a reddish cinnamon-brown colour.

The membranes and ears are of a pale reddish-brown colour, and translucent. "I could," says Mr. Waterhouse, "read this writing through the wing-membranes, moistened as they were with the spirit, at a distance of more than a quarter of an inch."

The dentition, according to Mr. Waterhouse, is—In. $\frac{2-2}{6}$; Can. $\frac{1-1}{1-1}$. The molars have not been examined.

The two inner upper incisors are, as in *K. picta* and *K. papillosa*, in advance of the others, long, curved, and pointed; whilst the outer two are placed considerably behind them, and are smaller.

Those of the lower jaw are trilobed and small.

The following dimensions have been taken (1) from the original specimen of *V. Hardwickii*, and (2) from the type specimen of *V. pellucidus*. Those of the second column will appear at first sight to differ a good deal from those of the first, but probably the latter may be considerably altered from its real size by the state of preservation. Such parts as could not be altered by this means, as the bones of the wings, do not differ materially, as may at once be seen by reference to the Table.

	1.		2.	
	"	"	"	"
Length of the head and body	1	3	1	9
—— of the tail	1	4	1	11
—— of the head	0	6	0	8
—— of the ears . . . . .	....		0	7
Breadth of the ears . . . . .	....		0	6
Length of the tragus . . . . .	....		0	4
—— of the fore-arm	1	$2\frac{3}{4}$	1	3
—— of the longest finger	2	8	2	$10\frac{1}{2}$
—— of the fourth finger	1	9	2	1
—— of the thumb	0	3	0	$3\frac{1}{4}$
—— of the tibia	0	7	0	7
—— of the foot and claws	0	4	0	4
—— of the <i>os calcis</i>	0	$5\frac{1}{2}$		
Expanse of wings	9	6	10	6

Hab. Java; Philippine Islands.

4. KERIVOULA LANOSA.

Vespertilio lanosus, Smith, Ill. Zool. S. Africa, pl. 50.

This species presents precisely the same generic peculiarities which characterize the foregoing, and they are quite as typically developed. It possesses the same elevated crown and small muzzle, and has ears and tragi of a similar shape, the differences being only such as are purely specific; but these differences, taken in the latter sense, are very conspicuous. Whilst the fur is relatively as long as that noticed of *K. papillosa*, it is, in addition to that, very thick and curly, with the tips very glossy.

But it is necessary first to notice some other slight differences which exist in the form of the ears and the distribution of the fur. The ears, although of the same general form as those of *K. picta* and the other species here treated of, yet differ in being more deeply notched externally towards the tip.

The tragus is of the same tapering and pointed form observable in the other species.

The face is very hairy, in some examples excessively so, the fur of the forehead almost concealing the ears; and it is of the same soft quality as that on the top of the head and on the back, a small quantity only in front of the eye assuming a more bristly appearance. The ears have their hinder surfaces clothed with hairs, and when viewed from behind are scarcely visible. The fur of the back does not encroach on the membranes of the wings, but extends over the base of the interfemoral membrane for nearly half its length, and, thinning out, leaves the hinder half naked. The upper surfaces of the tail, feet, tibiæ, fore-arms, thumbs and index-fingers are garnished with short and shining hairs of a silvery or pale golden-yellow colour.

The hinder margin of the interfemoral membrane, between the *os calcis* and tail, is furnished with a very remarkable comb-like fringe of prominent thick-set hairs, which, curving downwards, have their points directed towards the belly of the animal. On all the upper parts the fur is tricoloured, with a faint indication of a fourth colour. At the root it is blackish-grey for nearly half its length, which is succeeded by palish-brown, and this again for a very short length of a darker tint, and finally tipped with sulphur-yellow. The latter colour is on the head, neck, and shoulders so pale as to give a silvery appearance to the tips of the hairs, which is heightened by their being curly, somewhat as in the fur of the common Hare. Towards the hinder parts they are less curly, and more yellow in colour, especially those which grow on the legs, tail, and interfemoral membrane. The same may be said of those on the upper surface of the fore-arms, thumbs, and index-fingers.

Beneath, the fur is bicoloured, dark at the base, with the terminal fourth whitish-grey, very much as in the common *Vespertilio mystacinus*; but the light-coloured tips are more shining than in that species.

The membranes are of a medium brown colour, somewhat diapha-

nous, and have their veins thickly marked with glandular-looking dots.

The description of the cranium will be given in connexion with that of the skull of the next species, the better to illustrate by immediate comparison the difference between the two.

In the following Table of dimensions, the first column contains those of a male and the second those of a female, both from the same locality :—

	1.		2.	
	"	"	"	"
Length of the head and body, about..	1	9	2	0
—— of the tail	1	7	1	6
—— of the head	0	7	0	7
—— of the ears.....	0	4½	0	5
Breadth of the ears	0	5	0	5
Length of the tragus.....	0	3½	0	3½
—— of the fore-arm	1	2½	1	2¾
—— of the longest finger	2	9	2	9
—— of the fourth finger	1	11	1	10½
—— of the thumb.....	0	3	0	3
—— of the tibia	0	6	0	6
—— of the foot and claws	0	3½	0	3½
—— of the <i>os calcis</i>	0	9	0	8
Expanse of wings	10	0	10	3

Hab. South Africa (the eastern coast).

5. KERIVOULA ÆROSA, n. s.

This species, from the same locality as the last, resembles it in the long and curly nature of the fur, but is larger and differently coloured. The ears, too, are larger, with the ends more rounded, and less deeply notched externally.

The top of the head, although much elevated, is scarcely so much so, relatively, as in *K. lanosa*, and the muzzle is proportionally longer; but the nostrils and snout are shaped as in that species. The ears have their ends rounded, quite as much so as in the *Notched Bat* and *Natterer's Bat* of Europe; and the hollow in the outer margin near to the end scarcely deserves the name of notch. It is in fact a mere indentation, shallow, but regular, and occupying nearly one-third of the outer margin. In all other respects the ears resemble those of the foregoing species, and indeed those of the other representatives of the genus. The tragus offers no deviation in form from that of the species already described; it is long, tapering, and pointed.

The membranes are similar to those of *K. lanosa*, excepting that they are not quite so distinctly marked with dotted lines as in that species.

The fur of the head is only of medium length, and does not obscure the ears, nor extend so far along the face as in *K. lanosa*. The face is in fact moderately hairy, with a woolly moustache on the

upper lip, and a naked space between the eye and ear. The chin also is nearly naked.

On no part of the membrane does the fur of the back extend, and that of the under parts only to a very trifling extent on the base of the interfemoral membrane; but the upper surfaces of the legs, feet, and heel-cartilages, of the tail, fore-arms, thumbs, and index-fingers, and of the two terminal phalanges of the longest fingers, beyond the extremity of the index fingers, are more or less clothed with short adpressed shining hairs, thickest on the fore-arms and tail, but nowhere so thick as in the last species. The edge of the interfemoral membrane, between the heel-cartilage and tail, is sparingly furnished with short bristly hairs, very unlike the thick comb-like fringe of *K. lanosa*.

The fur of all the upper parts is long, thick, and curly, and nearly uniform in colour over the whole of the back, varying only in becoming a little darker towards the rump. It is of four colours,—dark grey-brown at the base for nearly half its length, succeeded by yellowish-brown, then by deep umber-brown, and tipped with shining bronzy yellow; that which is spread over the upper surface of the limbs, tail, &c. is wholly of the latter colour.

Beneath, the fur is of a dark sepia-brown colour, tipped with brownish-bronze colour.

In no other Bat have I seen fur at all resembling that of the present species. It is not difficult to attain a tolerably correct idea of its general appearance, by supposing a small species with fur of the quality and texture of that of the common Hare, but of a dark brown colour, and with the light tips observable in the fur of that animal, changed to a shining golden-bronze colour.

	1.	2.
Length of the head and body, about..	1 9	2 0
—— of the tail	1 6	1 8
—— of the head	0 8	0 8
—— of the ears.....	0 5½	0 5½
Breadth of the ears	0 5½	0 6
Length of the tragus	0 4	0 4
—— of the fore-arm	1 5	1 5
—— of the longest finger	2 9	2 10
—— of the fourth finger	2 1	2 1
—— of the thumb.....	0 3½	0 4
—— of the tibia	0 6½	0 6½
—— of the foot and claws	0 4	0 4
—— of the <i>os calcis</i>	0 7	0 7
Expanse of wings	10 6	10 6

Hab. South Africa, eastern coast (the same locality as the preceding species).

On comparing the skulls of three of the foregoing species, *K. picta*, *K. lanosa*, and *K. aërosa*, I find their general form to be pretty similar, but yet presenting some slight modifications which require notice. Of these, *K. lanosa* has the cranium proportionally the

shortest, and with the cerebral region most elevated, closely approaching *Furipterus* in this respect. It also has the facial portion more depressed, and the notch between the intermaxillary bones less deep than in *K. picta*; and these bones are not so much separated at their anterior extremities as in that species, so that the incisors which they bear are less separated also, and have an inward deviation from the line of the other teeth, contrary to what has been stated in the generic description. However, in this species, the upper incisors by no means approximate each other closely, as they do in *Furipterus*. In other respects the crania of *K. picta* and *K. lanosa* do not differ materially; and the dentition is also so similar as to present scarcely any differences worthy of notice. The outer incisor in the lower jaw has precisely the same central elevated cusp already noticed, and is similar in both species; but the skull of the third species, *K. aërosa*, has, on the contrary, the top of the skull less elevated than in *K. picta*, and the facial depression scarcely so deep, owing chiefly to the hinder extremities of the nasal bones having a somewhat inflated form. The facial portion of the skull is rather long in proportion to its entire length; and the bones of which it is composed are much thicker than in the other species, giving support to much longer and stronger teeth. Indeed the whole skull and teeth are much more substantial than the other and more typical species of the genus.

The lower jaw, with its teeth, is of proportionate strength, and is rather thick at the *symphysis menti*, where it has a slight descending process.

In number the teeth resemble those of the other species, but differ somewhat in their form. The outer lower incisors, although they have the central principal cusp already mentioned, yet have it so little developed that it would scarcely be regarded as singular if previous notice had not been called to it*. The upper incisors present a remarkable deviation from what appears typical: instead of two pairs of well-developed teeth, we find that the inner ones are long and pointed, but the outer ones merely rudimentary, so that they can scarcely be seen without the aid of a lens. The upper canines are long, strong, and angular; and the premolar next to them is also long and pointed. These differences in the teeth are alone sufficient to distinguish this species.

* It is curious and interesting to note the very slight outward deviation from the more typical forms, exhibited by this species, and to find on examination that it possesses also an internal departure from the same typical standard; and it is satisfactory to find that these differences are such as accord well with each other, externally and internally. The slightly more bulky appearance of the animal, accompanied by membranes of less delicate nature, and more imperfectly marked with the veins and papillæ which are so characteristic of this and the allied genera, is associated with an osseous system of greater solidity, and with upper incisors which approach in their inequality of size those of many of the species of the robust genus *Scotophilus*. If we examine, for instance, the upper incisors of the *Noctule* or the *Hairy-armed Bat*, we shall perceive at once that the inner ones are much the largest, just as they are in *K. aërosa*; and in those stout species of the genus *Vespertilio* which have a near affinity with *Scotophilus*, the same thing is observable.

The following are the dimensions of the crania of these three species :—

	<i>K. picta.</i>	<i>K. lanosa.</i>	<i>K. ærosa.</i>
	" "	" "	" "
Entire length of the skull exclusive of the incisors	0 7	0 6	
Greatest breadth across the zygomatic arches.....	0 4	0 3 $\frac{3}{4}$	0 4 $\frac{1}{4}$
Breadth of the skull behind the zygomatic arches.....	0 3 $\frac{1}{2}$	0 3 $\frac{1}{4}$	0 3 $\frac{3}{4}$
Length from the posterior root of the zygoma to the anterior point of the intermaxillary bones	0 4 $\frac{3}{4}$	0 4	0 5
Length of the zygomatic arches	0 2	0 2	0 2 $\frac{1}{2}$
Length of the bony palate	0 3	0 2 $\frac{3}{4}$	
Length of the dental series in the upper jaw	0 3 $\frac{1}{4}$	0 2 $\frac{3}{4}$	0 3
Breadth between the outer cusps of the two posterior molars.....	0 2 $\frac{3}{4}$	0 2 $\frac{1}{2}$	0 2 $\frac{3}{4}$
Breadth between the tips of the upper canines	0 1 $\frac{1}{2}$	0 1 $\frac{1}{4}$	0 1 $\frac{1}{2}$
Length of the lower jaw, exclusive of the incisors	0 5	0 4 $\frac{3}{4}$	0 5 $\frac{1}{4}$
Elevation of the condyle above the lower edge of the ramus.....	0 1 $\frac{3}{4}$	0 1 $\frac{1}{2}$	0 1 $\frac{1}{2}$
Length of the dental series in the lower jaw.....	0 3 $\frac{1}{2}$	0 3 $\frac{1}{4}$	0 3 $\frac{3}{4}$

The following species, having the wing-membranes attached as far along the foot as to the root of the toes, have been placed by Dr. Gray in this genus ; but their similarity to the species of other genera, or minor groups, has induced me to leave them out of the present monograph. *Kerivoula formosa* I have already separated from it, and placed in company with the *Vespertilio emarginatus* of Europe, and some other species. *K. Sykesii* is a small species, closely allied to, if not identical with, *Scotophilus coromandelicus* ; and *K. poensis* and *K. grisea* are both referable to the same subgeneric division of the genus *Scotophilus*, all having characters pretty similar to those of the *S. Pipistrellus*, *S. Kuhlii*, and *S. marginatus*. *K. trilatoides* is a true *Vespertilio*, having the same generic peculiarities as *Vesp. mystacinus*. *K. brasiliensis* I have not seen.

In a former monograph I gave a few notes on the classification of some of the species of *Vespertilionidæ* ; and I seize the present opportunity of adding such others as bear on the same point, which have arisen during the examination of the species comprised in the present memoir.

The observations I made were something to this purpose,—that after eliminating such easily recognizable genera as *Plecotus* and *Barbastellus* from the genus *Vespertilio*, as given by M. Temminck, there yet remained a large number of species differing greatly from each other, but the most diverse of which were so connected by intermediate species as to be with great difficulty brought under generic definition. The common *Noctule Bat* and the *Whiskered Bat* were given as familiar examples, the first being considered as typical of the stout species which are organized for strong and rapid

flight in exposed situations, and for capturing and masticating the larger species of Coleoptera; and the latter was given as an example of the light and comparatively fragile species which take their minute food amongst the foliage, or in other confined situations. But the *Whiskered Bat* is by no means the most typical of the slender species; the genera *Furipterus*, *Natalus*, and *Hyonycteris* are the most so, and *Kerivoula* immediately after them, and before *Vespertilio*, in which genus, in its restricted form, the *Whiskered Bat*, with many other species, takes its place.

Assuming that *Kerivoula* is a more typical genus than *Vespertilio*, we should expect its habits to be in accordance with its structure, and to differ somewhat from those of *Vespertilio*; and the following (all that I can gather which appears authentic) will throw some light on this point. In vol. xiv. of the 'Annals and Magazine of Natural History' the following notice of one of the species, *K. picta*, appears, from the pen of Capt. R. C. Tytler: "This elegant Bat is found in thick jungle, and is only observed when disturbed, by suddenly flying out of its retreat and taking almost immediate shelter, like a moth, amongst the bushes." Dr. Kelaart, after observing that there are no Bats in Ceylon called "*Kerivoulha*," says, "*Kehilvoulha* is the Cingalese name for the yellow Bats found on plantain trees,—'*Kehil*' in Cingalese meaning plantain, and '*Voulha*' a bat. We have never obtained the *Kerivoulha* from any other places than plantain groves, where they are generally found clinging to the fruit."

From the observations of these gentlemen it would appear that the *Kerivoula picta* is an arboreal species, certainly resting during the day among dense foliage, and most probably taking its food in similar situations. It would be interesting to know if those which Dr. Kelaart has seen clinging to the plantain fruit had chosen that as a resting place, or were in search of insects which might feed on the fruit; for we cannot suppose that the Bats would be feeding on the latter—they are too purely insectivorous in their structure.

Of another species inhabiting South Africa, *K. lanosa*, Dr. A. Smith says that it frequents "a wooded district stretching along the sea-shore about 200 miles from Cape Town. Like other species of the genus, it appears as night sets in, and may then be seen flitting from spot to spot along the open spaces which exist here and there in different parts of the forest."

These short extracts comprise all that I can learn of the habits of the genus under consideration; but such as they are, they tend to corroborate my previous supposition, derived from observing the obvious similarity of the organs of flight to those of some of the *Rhinolophi*, one species of which I have observed in a state of nature.

When we look at the considerable development of the cutaneous system, and its delicate nature, and the ample organs of flight with their slender digits, in the genus *Kerivoula*, we can readily perceive that they are not well-suited for exposed flight, but that they would be admirably adapted for flitting amongst the boughs and leaves of trees; and the existence of numerous lines and papillæ, probably

nerves of sensation, in the membranes, would render them highly delicate organs of touch, and a safe protection against the injuries which their slender members might otherwise sustain in such places. All the membranes of this and the allied genera *Furipterus*, *Natalus*, and *Hyonycteris* are elaborately veined and dotted, just as in the *Horse-shoe Bat*; and I have had a good opportunity of witnessing the extraordinary powers of flight of the latter.

On one occasion I had liberated from a box in my usual sitting-room a *Pipistrelle* and a *Lesser Horse-shoe Bat*. The former flew directly against the glass of the window, just as a bird does, and repeated the attempt to escape several times. The *Horse-shoe Bat*, instead of doing this, although it approached very near to the glass, never even so much as touched it with the tips of its wings; and I could distinctly see it pass in front of each pane so near as almost to touch it, but at the same time avoid the prominent wood-work of the window. Under and amongst the tables and chairs it passed with perfect ease, touching nothing, and behind the window curtains in a similar manner, although there was scarcely an inch of space between them and the wall. At length, when flitting in front of some book-shelves from which I had just removed an octavo volume (Temminck's *Birds of Europe*), it seemed, if I may use the expression, to *feel* the vacant space, and passed in and out again without, I believe, even so much as touching the volumes on either side.

Mr. Blyth has observed of *Natterer's Bat* that it occasionally "flapped against a glass case" while flying round a room. I have often seen various species of *Vespertilionidæ* do the like against the walls and furniture of a room, but have never seen the *Horse-shoe Bat* do so.

Now, although speculation in zoological science is scarcely admissible, yet I am tempted to suggest, from the general similarity of the organs of flight in the genera *Furipterus*, *Natalus*, *Hyonycteris*, and *Kerivoula* with those of *Rhinolophus*, that they may have precisely the same function to perform; and I should entertain but little doubt of this, were not the latter provided with very singular cutaneous expansions, as nose-leaves and facial crests. These have by some observers been considered as organs of touch, performing in fact the office of eyes. But this latter suggestion is at best a mere suggestion, since we find amongst the *Rhinolophidæ* some species which, while they possess all the other peculiarities of *Rhinolophus*, are destitute of what may properly be called a nose-leaf, having in its stead grooves and hollows not likely to be highly sensitive organs of touch. This is the case with *Rh. aurantius* of Australia, and with *Nycteris*, which is simply a modified *Rhinolophus*.

Without further pursuing these suggestions, I may state my belief that it is in the *whole expansion of the cutaneous system* that the singular sense with which these animals are endowed exists, and that this, if properly investigated, will afford one of the most certain indices to the natural classification of the *Vespertilionidæ*.

Before concluding, I wish to add a suggestion relative to the probable habits of *Hyonycteris*, derived from the examination of spe-

cimens. As the creature is destitute of claws to the feet, which could be used as instruments of support, and has suctorial disks instead, it appears probable that it would be capable of traversing such surfaces only as were sufficiently even for the action of the disks, and that suitable surfaces might be furnished by the fruit or leaves of many of the trees of tropical America, from which the pig-like snout of the animal would be well adapted for taking minute insects in a state of rest.

MISCELLANEOUS.

Note on Dysidea papillosa, Johnston.

By Dr. J. E. GRAY, F.R.S. &c.

MR. GEORGE BARLEE, on the 28th of August, wrote to me from Lerwick—"I have a curious Zoophyte I can send you: it is Johnston's *Dysidea papillosa*: it is not a Sponge, but a true Zoophyte: I saw the polype at work constantly: it is very abundant here." In another note, of the 8th of September, he further observes—"I saw, at Mr. Bean's, Johnston's *Dysidea papillosa*, and find it quite identical with my shell and organism, although the former is attached to a shell, and mine is free, which at once sets the matter at rest." Mr. Barlee further adds (November 3), "that there were more came up in the dredge free, than were attached, and that they seem to abound on muddy ground both east and north of Brassey Island, about thirty miles off, and in about 70 or 80 fathoms of water. The polype seemed generally very active, and I saw no shifting of position of the animals while I had them in the basin, although there might have been some during the nights; but I often watched them for half-an-hour at a time, and perceived no change of position."

Mr. Barlee has kindly sent some specimens to the British Museum. The coral has all the more important external characters and organization of the genus *Corticifera* of Lesueur (Acad. Nat. Sci. Philad. i. 178. t. 8. f. 6, 7), found in the West India islands. But a genus (*Sidisia*) must be formed for it, as, while *Corticifera* consists of a number of short cylindrical animals springing from an expanded base, *Sidisia* is cylindrical, more or less branched, and free, or only attached by its base to a shell or rock.

On the Auditory Apparatus of Insects. By C. LESPÉS.

The author places the seat of hearing in Insects in the antennæ. He refers to the apertures in the surface of the antennæ described by Erichson, which, he states, exist in all insects; they are closed by a membrane like the tympanum, or rather, like the *fenestra rotunda* of the ear of the Vertebrata. These the author proposes to call *tympanules*.

Behind the membrane or tympanule, and applied directly to its surface, there is a small sac filled with a thick fluid, and almost always containing a solid body; this is probably an auditory sac

with an otolithe. In some cases the author has traced one of the terminal filaments of the antennal nerve into this auditory sac.

These organs are always of the same construction, and differ only in size; but their magnitude bears no relation to that of the insect. Their number is very variable: in the antenna of the Libellulidæ the author has found only four, whilst in the Lamellicorn Beetles there is an immense number of them. Their position on the antenna is very variable, but always in relation to the form of the organ.

In some Myriapoda the author has observed a remarkable arrangement. About the middle of the antenna of the *Scutigera coleoptrata* here is a sort of knot or swelling formed by two joints, between which there is a small sac receiving a branch of the antennal nerve. In *Julus terrestris* there are two analogous structures placed side by side.

The author's experiments on hearing in Insects have rarely furnished him with incontestable results, but they nevertheless lead him to believe that the organs above mentioned are the seat of this sense. Should this prove to be the case, he calls attention to the remarkable fact that these animals possess not only compound eyes, but also compound ears.—*Comptes Rendus*, August 30, 1858, p. 368.

Why does the Queen Bee lay an Unfecundated Egg in the Drone-Cells, and a Fecundated Egg in those of the Workers and Queens? Is there in this, on the part of the Queen, an Intelligent or Instinctive Act? By Dr. KÜCHENMEISTER.

The author, assuming the truth of the results put forward by Von Siebold in his remarkable essay on "Parthenogenesis," namely that the drone-producing eggs of the Hive-Bee are unimpregnated, and those of the queens and workers impregnated, proceeds to give what may be called a mechanical explanation of the facts.

He says that in the Wasps and Bees the seminal receptacle is placed so that the semen has to travel a considerable distance to reach the oviduct. In this case, there are three causes which may facilitate the flow of semen:—

1. The fulness of the receptacle.
2. A pressure acting upon the bottom of the receptacle from behind and below, forwards and upwards.
3. The action of a muscular apparatus situated in the upper half of the receptacle.

At the moment when the eggs destined to produce males are going to be laid, the queen is placed upon the combs without sensibly curving her body, and the egg glides without effort into the cell; whilst in laying the eggs which are to furnish queens, she turns her head outwards, and twists the abdomen to make it enter the cell. The margin of the cell exerting a pressure upon the bottom of the seminal receptacle, together with the contortion of the body, explain in this case the ejaculation of the semen and the fecundation of the eggs.

For the fecundation of the eggs destined to furnish workers, it is sufficient, in a fertile and vigorous queen, that there should be a simple pressure of the parenchyma upon the seminal receptacle: when the store of semen begins to be exhausted, the muscular apparatus probably comes into play.

When the queen deposits an egg in a large cell intended for a male, the edge of the cell exerts no pressure upon the abdomen, or the pressure is exerted only above the seminal receptacle; the latter therefore is not raised, and the oblique position of the ejaculatory canal in relation to the oviduct prevents the ejaculation. Thus, according to the author, it is to the difference in the diameter of the cells that the production of the different sexes in the Hive-Bee is due.—*Moleschott's Untersuchungen; Bibl. Univ. de Genève*, September 1858, p. 94.

On the Development and Propagation of the Trichocephalus dispar and Ascaris lumbricoides. By C. DAVAINÉ.

1. The *Trichocephalus dispar* occurs so commonly in the cæcum of man, that the author calculates that in Paris one-half of the inhabitants are infested by it. The development of this worm has not been observed, and its mode of transmission is quite unknown. The eggs are frequently evacuated with the fæces. The repeated examination of eggs found in the contents of the intestine of corpses, or in the evacuations of patients, leads the author to conclude that *these ova undergo no development in the human intestine, and that they are always expelled in the condition in which they escape from the body of the mother*. The author therefore attempted to obtain the development of the ova in water, but several times without success. At the end of September, 1857, he collected a great quantity of these ova, and washed them for several days, until the water containing the ova was limpid and destitute of any odour. The liquid was renewed from time to time, and the ova were examined with the microscope every week. A certain number underwent alteration; others remained uninjured, but without presenting any trace of development. At the beginning of April, after six months' watching, the vitellus, in some of these ova, collected into a rounded mass and acquired some consistence, as was proved by crushing the ova. Some days afterwards, the vitellus in many ova underwent segmentation into two, and then into four parts; the segmentation then followed the ordinary course, and, at the beginning of May, many of the yolks had acquired a mulberry-like appearance. From this time no change was observed until the 12th of June, when some of the ova contained a well-formed embryo, recognizable by its movements. This embryo, which to a certain extent possesses the form of the adult, tapers gently from behind forwards; its length is about $\frac{1}{10}$ millim.

2. On the 8th of October, 1857, the author collected numerous ova of *Ascaris lumbricoides* by washing the fæces of a child who had passed several of these worms. These ova were preserved in pure water, and examined from time to time, like the preceding. For six months no change was observed; but on the 14th of April several of them had undergone segmentation into two, and some into four parts, whilst the greater number exhibited no change. On the 30th of April, segmentation had taken place in all, but in various degrees: in some the vitellus represented a small mammillated sphere; on the 5th of May this had become reniform, and on the 7th the embryo

was apparent. The embryo is cylindrical, with the caudal extremity suddenly terminating in a point; its length is $\frac{1}{4}$ millim.: its mouth does not show the three tubercles characteristic of the *Ascarides*. From the 7th of May to the 21st of June the embryos had continued living within the shell of the egg, and none of them had escaped.

The author placed the ova in the gastric juice of the rabbit and dog; but after staying in these fluids for three or four days, the shell remained perfectly intact. M. Richter, who placed the ova of this worm in water, found, after the lapse of eleven months, that they contained embryos; but he was unable to see them hatch.

The ova, like those of the *Trichocephalus*, are evacuated with the fæces; and before their evacuation they never show the least trace of development. In October last, ova kept for a fortnight at a nearly constant temperature of 86° F., acquired no development. The same ova, left in a room in which the temperature never exceeded 61° F., underwent segmentation in April. Ova collected in January underwent segmentation in June; whilst others collected in April presented no trace of development in June, notwithstanding the great heat of the season. Temperature therefore would seem to have little or no influence on the ova of *Ascaris lumbricoides*, which require to remain for a long time in a state of latent life.

Hence the author concludes—1. That the ova of these worms are developed out of the human body; and 2. That the appearance of the embryo does not take place until after the lapse of eight months in the one case and six months in the other. In this long interval, the ova may be transported by rains into brooks, rivers, and wells, the water of which is used for drinking and preparing food. In this way the fully-developed ova or the embryos may find their way into the human intestine.—*Comptes Rendus*, June 21, 1858, p. 1217.

Note on Enteromorpha cornucopiæ.

By Dr. J. E. GRAY, F.R.S. &c.

Professor Harvey admits this species with doubt, on the authority of the late Capt. Carmichael (*Phytologia Brit.* t. 304); but I think there can be no doubt that Lyngbye and Agardh are correct in regarding it as a variety of *Enteromorpha intestinalis*, or rather, a form of that species produced by the peculiar position in which it is found.

It is very abundant in one locality in Broadhaven, in St. Bride's Bay, South Wales, growing where some fresh water trickles down the side of a nearly perpendicular rock. The whole width of the trickle is covered with the green Alga as close as it can grow, side by side. The plants on the top of the higher and nearly horizontal ridges, which the water only trickles over, are all the bell-shaped *E. cornucopiæ*, f. 3, and the specimens on the perpendicular parts are the oblong tubular specimens of that plant, like f. 2 of Dr. Harvey's plate above quoted, while the specimens growing in the pools left in the small cavities of the rock are all more or less elongate normal *Enteromorpha intestinalis*.

The bell-shaped form in some instances appears to be produced by the withering-away of the upper part of the oblong specimens; in

other cases it seems to be the natural growth of the specimens. Capt. Carmichael, like some botanists, seems to consider species to depend on the "distinction of the character" that can be assigned for a species, rather than on the distinctness of the structure and economy of the species itself: for it must be well known to all practical naturalists that many species, which are very difficult to distinguish by characters, are nevertheless distinct, while specimens which offer, like *Enteromorpha cornucopiæ*, a striking peculiarity in external characters, easily expressed in words, are only accidental or local varieties, which can, by mere transplantation, be converted into the presumed species.

On the Liability of Shells to Injury from the Growth of a Fungus.
By the Rev. H. H. HIGGINS, M.A.

It has often been observed that shells kept for a considerable time in cabinets are apt to lose much of their original freshness and beauty of appearance. This kind of injury chiefly affects such specimens as have a bright enamelled surface, which at length becomes dull and less pleasant to the touch. Several suggestions have been made with reference to the probable cause of the change, which has often been attributed to the efflorescence of saline matter absorbed by the shell; but, so far as I have observed, the specimens most liable to injury from saline incrustation belong to genera in which the shells are without enamel, as *Littorina*, *Turritella*, &c.; and many collectors are in the habit of steeping their specimens in fresh water for some days, before placing them in their cabinets,—a process which is said to be an effectual preservative from injury by saline efflorescence. Mr. Dennison of Woolton attributed the loss of lustre in enamelled shells to the ravages of a minute insect, but had not been able to detect the depredator. Many of the shells in my own cabinet suffered such serious injury during last winter, that I was led to investigate the cause, which indeed became obvious enough by the use of a microscope. An ordinary lens showed the enamel of the shell to be beset with small bristly points; and when a portion of the surface was scraped off and submitted to a higher magnifying power, the forms of at least two species of Fungi became apparent,—one resembling a *Mucor* with a globose sporangium, the other, and much more common form, exhibiting both simple and moniliform filaments, with an abundance of minute spores, seemingly quite free. After having been carefully washed, the surface of the shell was found to be as it were engraved in some places with stellular marks, in others with striæ forming irregular reticulations—caused, no doubt, in each instance by the spreading mycelium of the Fungus. It is scarcely necessary to add that attacks of this nature need not be apprehended where shells are kept in a perfectly dry or well-ventilated place. A slight deposition of moisture does, however, frequently occur upon their surfaces whilst shells are undergoing examination, in which case it would be a safe precaution to allow them for a while to remain exposed to the air, before returning the drawer to the cabinet.—*Proc. Lit. and Phil. Soc. of Liverpool*, No. 12, 1858.

Description of a new species of Himalayan Mole (Talpa macrura).

By B. H. HODGSON, Esq.

In preparing a set of skins and skulls for despatch to Europe, I find a marked species of Mole which has not been, I think, described, and which differs from the ordinary Himalayan one by being a third smaller, yet having a tail five times as long. The following is its summary description:—

Tip of snout to base of tail 4 inches. Head $1\frac{1}{8}$ inch. Tail and hair $1\frac{1}{4}$ inch; tail only, $1\frac{1}{16}$ inch, palma and nails $\frac{3}{4}$ inch, planta and nails $\frac{3}{4}$ inch.

Its colour is deep slaty blue, with canescent gloss, iridescent when wet.

The tail is cylindric and pretty well covered with soft hair, which extends a little beyond its tip. As I called the other *micrura*, so I name this one *macrura*.

Moles are very abundant in the Himalaya, the deep bed of black vegetable mould, everywhere prevailing (so long as its protecting cover of forest and brushwood is not cleared off), affording a plentiful supply of those earth-worms which constitute the Mole's chief food.

The abundance of Moles, therefore, gives a distinct clue to the surface-character of this gigantic system of mountains, or rather to the Indian slope of it, and most especially to the central or normal region.—*Journal of the Royal Asiatic Soc. of Bengal*, No. 2, 1858.

On Euchætes coccineus, a new genus of Birds.

By P. L. SCLATER, M.A.

The single specimen of this bird in M. Verreaux's collection from the Rio Napo is the most interesting novelty which I have met with since I commenced studying the group to which it belongs. Its plumage is precisely that of a *Ramphocelus*, but the structure is quite different, and renders it impossible to place it in that group. The form of the bill is rather that of the true *Tanagra*, and agrees more nearly with that of *Tanagra olivi-cyanea* and *Buthraupis eximia*, but it is shorter, thicker, and more swollen than in the former, though not so much so as in the latter of these birds. The tail is comparatively much shorter than in either of these forms; and altogether it is, I think, impracticable to arrange it in any other way than as a separate generic division, for which the following characters may suffice:—

Rostrum forte, breve, carinatum, compressum, culmine arcuato, gonyde ascendente, dente finali distincta, commissura paululum sinuata; vibrissis nullis: alæ longæ, remige prima quartam æquante et a secunda et tertia longissimis paulo superatis: cauda brevis, apice modice rotundata: pedes fortes, sicut in genere Buthraupis: ptilosis coccinea, nigro varia.

EUCHÆTES COCCINEUS, J. Verreaux, MS.

Coccineus: loris, facie et mento cum gutture et collo antico, alis caudaque nigerrimis: rostro et pedibus nigris.

Long. tota 6·5, alæ 3·5, caudæ 2·4, rostri a fronte 0·55, a rictu 0·7, tarsi 0·9.

Proc. Zool Soc. Jan. 26, 1858.

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